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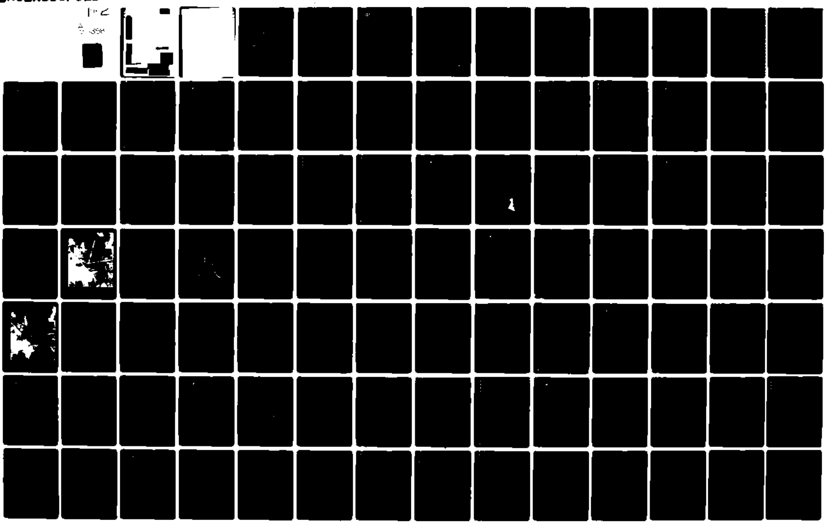

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE, VA 23665

REPLY TO ATTN OF: DEEV

30 JUL 1982

SUBJECT: Installation Restoration Program (IRP) Records Search, Kingsley Fld

TO: See Distribution

1. We provided your office with copies of the subject report on or about 23 Mar 82. This study used a site rating model developed in Jun 1981 to identify the potential for contamination resulting from past disposal practices. On 26-27 Jan 82, representatives of USAF OEHL, AFESC, several major commands, Engineering Science, and CH2M Hill met at our office to develop an improved rating system. The new rating model, Hazardous Assesment Rating Methodology (HARM), is now used for all Air Force IRP studies. To maintain consistency, AFESC had their on-call contractors review their phase I studies performed before the advent of HARM and provide two additional appendices. The new appendices address the background of the HARM system and evaluate each of the phase I sites using the Jan 82 rating methodology.

2. Enclosed are copies of the added appendices for the Installation Restoration Program (IRP) Records Search at Kingsley Field. Request you attach these appendices to the phase I reports we provided you in Mar 82.

3. For AFRCE-WR: Request you distribute copies of the new appendices to the Regional Environmental Protection Agency and Oregon State Department of Environmental Quality.

4. For DTIC: Request you integrate the enclosed appendices with the Installation Restoration Program Records Search for Kingsley Fld into the National Technical Information System (NTIS). The report and new appendices are approved for public release with unlimited distribution.

5. Our project officer for IRP is Mr. Burnet, A/V 432-4430.

FOR THE COMMANDER

George C. Windrow

GEORGE C. WINDROW
Actg Dir of Eng & Env Plng

1 Atch
Appendices

Readiness is our Profession

82 08 12 055

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

For

Kingsley Field, Oregon

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

By

CH2M HILL
Gainesville, Florida

June 1982
~~February 1981~~

Contract No. F08637 80 G0010 0010

NOTICE

This report has been prepared for the United States Air Force by CH2M HILL SOUTHEAST, INC., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, or the Department of Defense.

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AFB	Air Force Base
AFESC	Air Force Engineering and Services Center
AFH	Air Force Headquarters
AFS	Air Force Station
AGE	Aerospace Ground Equipment
ANG	Air National Guard
AVGAS	Aviation gasoline
BLM	Bureau of Land Management
BOD	Biochemical oxygen demand
BUIC	Back-up Intercept Control
CE	Civil Engineering
COD	Chemical oxygen demand
DOD	Department of Defense
DPDO	Defense Property Disposal Office
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
ft	Foot (feet)
IRP	Installation Restoration Program
JSS	Joint Surveillance System
kW	Kilowatt
Max.	Maximum
Min.	Minimum
MOGAS	Motor gasoline
MBTU	1,000 British Thermal Units
NOAA	National Oceanic Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
No.	Number
OEHL	Occupational and Environmental Health Laboratory
PD-680	Safety solvent (petroleum distillate)
PCBs	Polychlorinated biphenyls

POL	Petroleum, oil, and lubricants
RCRA	Resource Conservation and Recovery Act
SAGE	Semi-Automatic Ground Environment
STP	Sewage Treatment Plant
TAC	Tactical Air Command
TOC	Total organic carbon
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A. Introduction

1. CH2M HILL was retained by the Air Force Engineering and Services Center (AFESC), on 10 August 1981, to conduct the Kingsley Field Records Search under Contract No. F08637 80 G0010 0010, using funding provided by the Tactical Air Command (TAC).

2. Department of Defense policy was directed by Defense Environmental Quality Program Policy Memorandum 80-6 dated 24 June 1980 and implemented by Air Force message dated 2 December 1980 as positive action to ensure compliance of military installations with the Resource Conservation and Recovery Act (RCRA) and implementing regulations. The purpose of DOD policy is to control the migration of hazardous material contaminants from DOD installations.

3. To implement the DOD policy, a three-phase Installation Restoration Program has been directed. Phase I, the Records Search, is the identification of potential problems. Phase II is the quantification of the problem and determination of corrective measures that may be required. The third phase is to contain, correct, and/or mitigate identified or potential environmental hazards that may be the result of contaminant migration from the installation.

4. The Kingsley Field Records Search included a review of pertinent installation records, contacts with 14 outside agencies for documents relevant to the Records Search effort, and an on-site base visit conducted by CH2M HILL on 12 and 13 November 1981. An inbriefing and an outbriefing were held with the 827th Air Defense Group Commander to describe the purpose of the site visit and to present the major findings. Activities conducted during the on-site base visit included interviews with 15 past and present base employees and ground tours of the base facilities. Installations included in the Records Search Program were Kingsley Field, Keno Air Force Station (AFS), Klamath AFS, and the Falcon Heights housing annex. No on-site visit was conducted at Klamath AFS.

5. Potentially contaminated sites were rated using a modification of the hazard rating system developed by JRB Associates, Inc. The system was modified by the Air Force, CH2M HILL, and Engineering Science. The methodology used to identify the potentially contaminated sites included a review of base industrial activities, past waste management practices and field investigations. If no hazardous waste contamination seemed likely at a particular site, it was deleted from further consideration. At those sites where contamination was likely, a decision was made on whether the contaminants could migrate beyond the base boundaries. If so, the site was numerically rated and prioritized. If not, any critical environmental concerns involving on-base contamination were reported to base personnel.

6. Should the records search indicate that the potential exists for migration of hazardous contaminants beyond the installation boundaries, Phase II field work would be conducted to confirm the presence of the specific migrating contaminants and to determine the extent of migration. Restoration or containment of the hazardous waste disposal sites would comprise Phase III of the Installation Restoration Program.

B. <u>Findings</u>

1. No direct evidence was found to indicate that migration of hazardous contaminants beyond Kingsley Field property exists. On-site investigations and review of available information on Kingsley Field revealed no significant environmental stress caused by U.S. Air Force hazardous waste disposal.

2. Information obtained through interviews with 15 past and present base personnel and through field observation indicates that small quantities of hazardous wastes (primarily waste oils and solvents) have been disposed of on Air Force property at Kingsley Field in the past.

3. Industrial activity at Kingsley Field consists primarily of routine vehicle maintenance. Prior to 1972, routine aircraft maintenance for a relatively small squadron was conducted. Generation of large quantities of hazardous wastes has not occurred in comparison to bases having significant aircraft rework and maintenance missions. As a result, the potential for a large-scale contamination problem is considered to be relatively low.

C. Conclusions

1. Portions of the major landfills are below the groundwater table and some degree of contamination is likely. Low precipitation, high potential evaporation rates, and low groundwater gradients reduce the potential of contaminant migration from these sites.

2. Drainage ditches located in and near Kingsley Field intercept shallow groundwater on most of the field. Widespread occurrence of shallow, low-permeability clay and silt strata tends to prevent the movement of shallow groundwater into deeper aquifers. Where these strata were removed during waste disposal operations, the potential exists for contaminant migration into the saturated sand strata and deeper aquifers.

3. Indirect evidence of hazardous groundwater contamination (high specific conductance and chloride) was indicated by water quality analyses for a well located near Base Landfill No. 3. The potential for groundwater contamination from landfill activities exists because of the probable direction of groundwater movement from the landfill to the well.

4. Table V-1 presents a priority listing of the rated sites and their overall scores. Although the crop duster washdown area is considered to be the most significant contamination source, the Air Force has no control over the area and it is not rated. The potential exists for hazardous contaminant migration from the base landfill Site No. 3. The

existing fire training area, another base landfill, and a diesel oil spill area (Sites No. 8, 2, and 11) are not considered to be major problem areas because of the small quantities of potentially hazardous wastes and the relative lack of migration pathways and receptors.

The remaining sites are not considered to present a significant migration hazard. Transport of hazardous debris through surface erosion is not anticipated.

D. Recommendations

1. Indications of potential contaminant migration from Site No. 3 were found, and limited monitoring is recommended to verify that hazardous contaminant migration is not occurring and to ensure that private water supplies located near the landfill are protected. This limited program should be conducted as early as possible in the Phase II program.

2. Specifically, two groundwater quality monitoring wells with depths equal to the depths of the nearby private wells (60-foot maximum) should be installed down-gradient (southeast) from Site No. 3 along the perimeter road. A background groundwater quality monitoring well of similar depth should be installed immediately up-gradient (northwest) from the fill.

   The wells should be sampled and analyzed for the following constituents:

- total organic carbon (TOC)
- chemical oxygen demand (COD)
- oil and grease
- pH
- specific conductance
- chloride

3. If possible, samples should be obtained from the private water wells located southeast of Site No. 3. These samples should be analyzed for the previously listed constituents.

4. Should the results from these tests indicate that contaminant migration may be occurring, samples should be obtained from the monitoring wells (and private wells, if possible) and analyzed for DDT, trichloroethylene, methyl ethyl ketone, and total phenols.

5. If significant hazardous contaminant migration is observed when sampling the monitoring wells at Site No. 3, the installation of monitoring wells at Sites No. 10 and 2 is recommended.

6. Klamath County Vector Control and the Oregon State Department of Ecology should be notified of the potential contaminant migration problem caused by washdown of the privately owned crop-dusters. More detailed evaluation of the potential hazard should be encouraged.

7. Specific details of the limited Phase II program outlined above should be finalized during the initial stages of Phase II. It is not the intent of

this program to assess the exact depth or location of monitoring wells. In the event that contaminants are detected in the water samples collected from any of the wells, a more extensive field survey program should be implemented to determine the extent of the contaminant migration. The Phase II Contractor should be responsible for evaluating the results of the program outlined above and for recommending additional monitoring, as appropriate.

I. INTRODUCTION

I. INTRODUCTION

A. Background

The primary legislation governing the management and disposal of solid waste is the Resource Conservation and Recovery Act (RCRA) of 1976. Regulations and implementing instructions for the Act are continuing to be developed by EPA. Under RCRA Section 3012 (Public Law 96-482, October 21, 1981), each state is required to inventory all past and present hazardous waste disposal sites. Section 6003 of RCRA requires Federal agencies to assist EPA and make available all requested information on past disposal practices. It is the intent of the Department of Defense (DOD) to comply fully in these as well as other requirements of RCRA. Simultaneous to the passage of RCRA, the DOD devised a comprehensive Installation Restoration Program (IRP). The purpose of the IRP is to identify, report, and correct environmental deficiencies from past disposal practices that could result in groundwater contamination and probable migration of contaminants beyond DOD installation boundaries. Critical environmental concerns involving on-base contamination are also identified and reported to base personnel. In response to RCRA and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, the DOD issued Defense Environmental Quality Program Policy Memorandum 80-6 (DEQPPM 80-6) on 24 June 1980, which directed the implementation of the IRP program.

To conduct the Installation Restoration Program Records Search for Kingsley Field, the AFESC retained CH2M HILL on 10 August 1981, under Contract No. F08637-80-G0010-0010, using funding provided by the Tactical Air Command (TAC).

The installations included in the Records Search are Kingsley Field and several off-site facilities (Figures 1 and 2), as follows:

1. Keno AFS
2. Klamath AFS
3. Falcon Heights housing annex

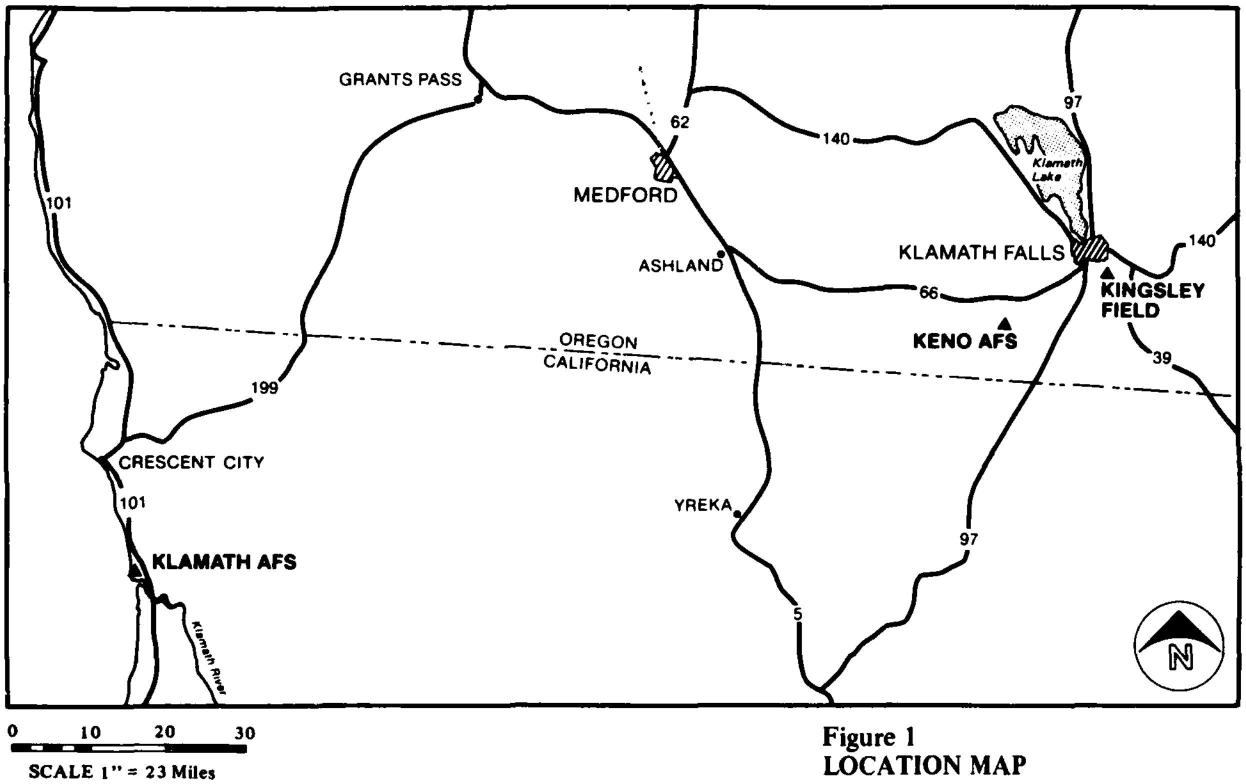


Figure 1
LOCATION MAP
KINGSLEY FIELD,
KENO AFS, AND KLAMATH AFS

The Records Search comprises Phase I of the Department of Defense (DOD) Installation Restoration Program, and its purpose is to review installation records to identify possible hazardous-waste contaminated sites and assess the potential for contaminant migration from the site. Phase II is the quantification of the problem and determination of

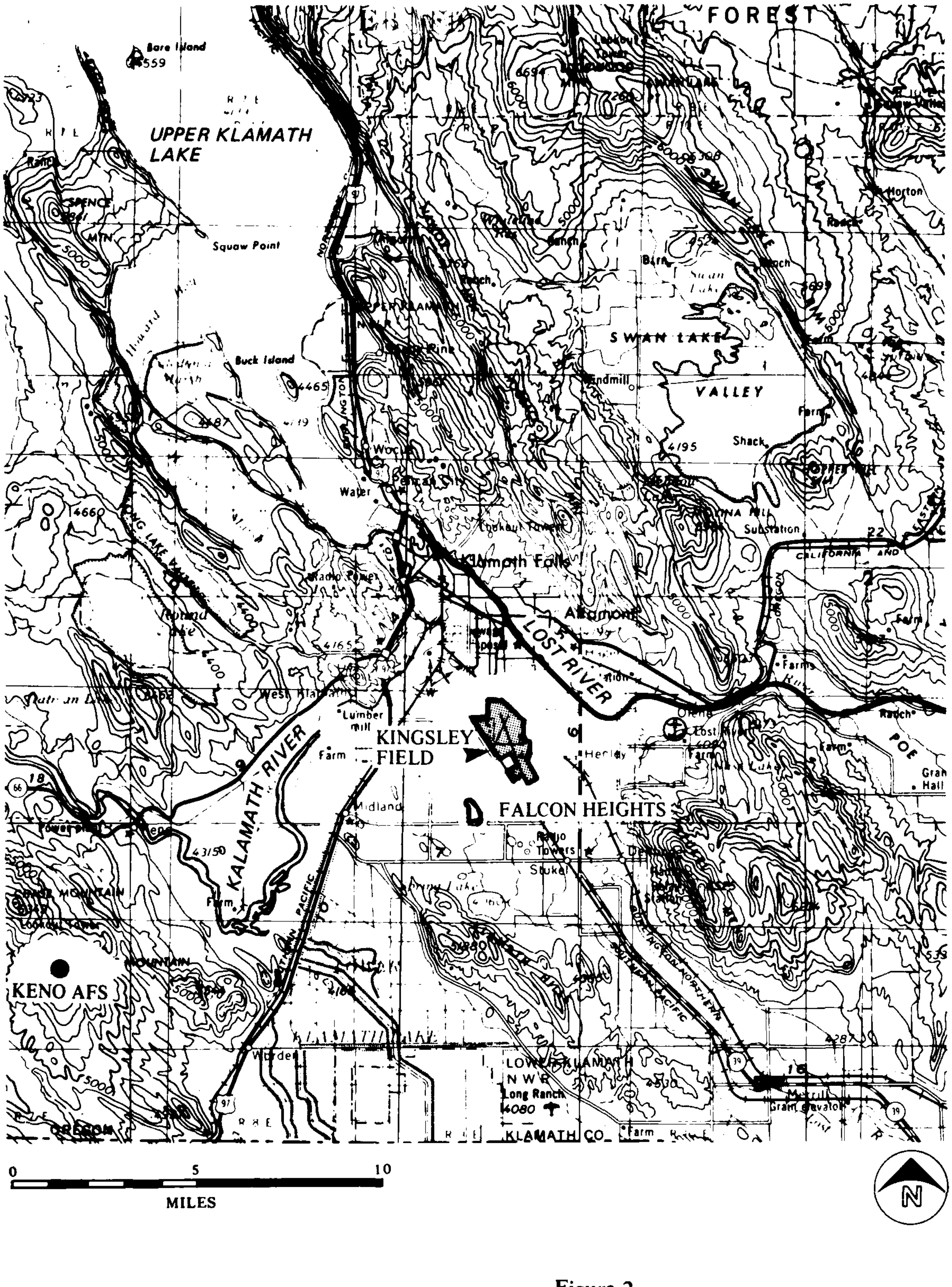


Figure 2
LOCATION MAP
KINGSLEY FIELD, FALCON HEIGHTS,
KENO AFS

corrective measures that may be required. The third phase is to contain, correct, and/or mitigate identified potential environmental hazards.

B. Authority

Identification of hazardous waste disposal sites at military installations was directed by Defense Environmental Quality Program Policy Memorandum 80-6 (DEQPPM 80-6) dated 24 June 1980 and implemented by Air Force message dated 2 December 1980, as a positive action to ensure compliance of military installations with the Resource Conservation and Recovery Act (RCRA) and implementing regulations.

C. Purpose of the Records Search

DOD policy is to control the migration of hazardous material contaminants from DOD installations and to abate contaminants that may have an adverse impact on public health or the environment. This potential was evaluated at Kingsley Field by reviewing the existing information, interviewing base personnel, and conducting a detailed analysis of installation records. Pertinent information involves the history of operations and the geological and hydrogeological conditions that may contribute to the migration of contaminants off the installation, and the ecological settings which indicate sensitive habitats or evidence of environmental stress resulting from contaminants.

D. Scope

The Records Search consisted of a pre-performance meeting, an on-site base visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at Nellis AFB, Nevada, on 17, 18, and 19 August 1981. Representatives of the AFESC, USAF Occupational and Environmental Health Laboratory (OEHL), Tactical Air Command (TAC), and CH2M HILL attended this meeting. The objectives of this meeting were to provide detailed project instructions for the Records Search, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the Kingsley Field Records Search.

The on-site base visit was conducted by CH2M HILL on 12 and 13 November 1981. An inbriefing and an outbriefing were held with the 827th Air Defense Group Commander to describe the purpose of the site visit and to present the major findings. Activities performed during the on-site base visit included a detailed search of installation records, ground tours of the installation, and interviews with 15 former and present base personnel. The following individuals were on the CH2M HILL Records Search team:

1. Mr. Michael Kemp, Project Manager (M.S., civil and environmental engineering, 1978)

2. Mr. Steven Hoffman, Project Senior Consultant (B.S., civil engineering, 1971)

3. Mr. Fritz Carlson, Hydrogeologist (M.S., hydrology, 1974)

4. Ms. Jane Gendron, Ecologist (B.A., biology, 1976)

Resumes of these team members are included in Appendix A.

Fourteen outside agencies (see Appendix B) were contacted for documents relevant to the Records Search effort.

Individuals from the Air Force who participated in the Kingsley Field Installation Restoration Program included:

1. Mr. Bernard Lindenberg, AFESC, Program Manager, Phase I

2. Mr. Myron Anderson, AFESC, Assistant Program Manager, Phase I

3. Mr. Gil Burnet, TAC, Command Representative

4. Ms. Lois Seibt, Kingsley Field, Site Investigation Coordinator

5. Major Gary Fishburn, USAF OEHL, Program Manager, Phase II

E. Methodology

The methodology used in the Kingsley Field Records Search is shown graphically in Figure 3. First, a review of past and present industrial operations was conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas of the base.

The next step in the activity review process was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various industrial operations on the base. Included in this part of the activities review was the identification of all past landfill sites and burial sites, as well as any other possible sources of contamination such as major PCB or solvent spills or fuel-saturated areas resulting from large fuel spills or leaks.

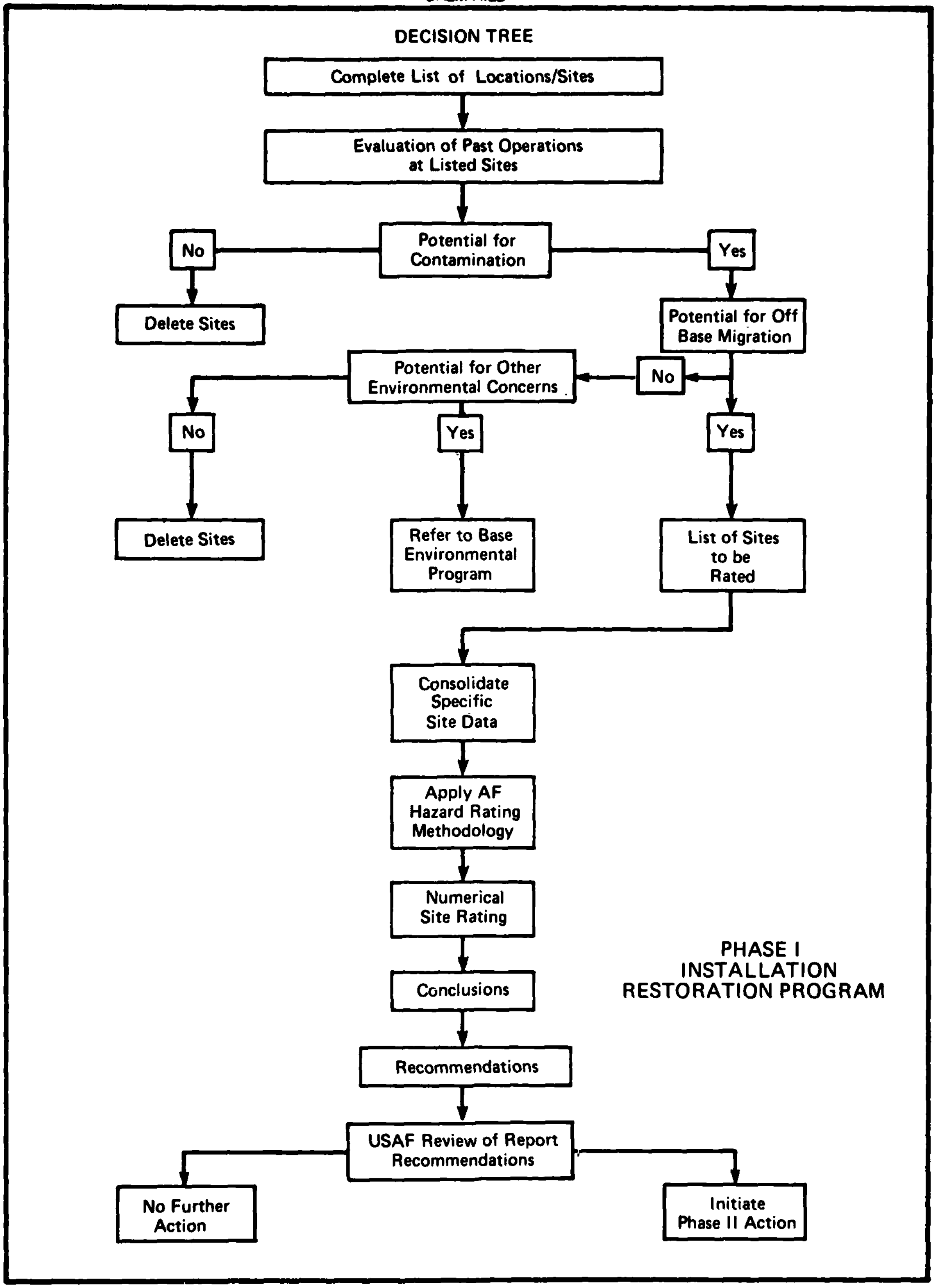


Figure 3
RECORDS SEARCH METHODOLOGY

A general ground tour of identified sites was made by the Records Search Team to gather site-specific information including (1) evidence of environmental stress, (2) the presence of nearby drainage ditches or surface-water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination in any of the identified sites. If not, the site was deleted from further consideration. If operations and maintenance deficiencies were noted during the investigations, the condition was reported to the Base Environmental Coordinator for remedial action.

For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination beyond the installation boundaries was made by considering site-specific soil and groundwater conditions. If there was potential for on-base contaminant migration or other environmental concerns, the site was referred to the base environmental monitoring program for further action. If no further environmental concerns were identified, the site was deleted from consideration. If the potential for off-base contaminant migration was considered significant, then the site was rated and prioritized using the site rating methodology described in Appendix H.

The site rating indicates the relative potential for hazardous contamination and contaminant migration at each site. For those sites showing a high potential, recommendations were made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a moderate hazard potential,

a limited Phase II program may be desirable to confirm that a contaminant migration problem does not exist. For those sites showing a low hazard potential, no Phase II work would be recommended.

II. INSTALLATION DESCRIPTION

II. INSTALLATION DESCRIPTION

A. Location

Kingsley Field occupies approximately 1,100 acres and is located in the Klamath Basin section of south-central Oregon, 5 miles south of Upper Klamath Lake and approximately 14 miles north of the Oregon-California border. Of the 1,100 acres of land on Kingsley Field, 74 acres are owned by the U.S. Air Force and the remainder is owned by the City of Klamath Falls (Figure 4). USAF exclusive-use areas are on city-owned property. The City of Klamath Falls lies 3 miles northwest of the field, and the City of Altamont lies on the northern edge of the base. The Klamath River and Lost River run 3 miles west and east of the field, respectively.

In addition to the land contained within the field boundaries, this report addresses the following off-base property:

1. Keno AFS (289 acres total, 13 acres USAF-owned) located on Hamaker Mountain approximately 10 miles southwest of the field

2. Klamath AFS (155 acres), located approximately 25 miles south of Crescent City, California, on the coast

3. Falcon Heights housing annex (290 units) located 5 miles south of the field

The locations of these properties are shown in Figures 1 and 2.

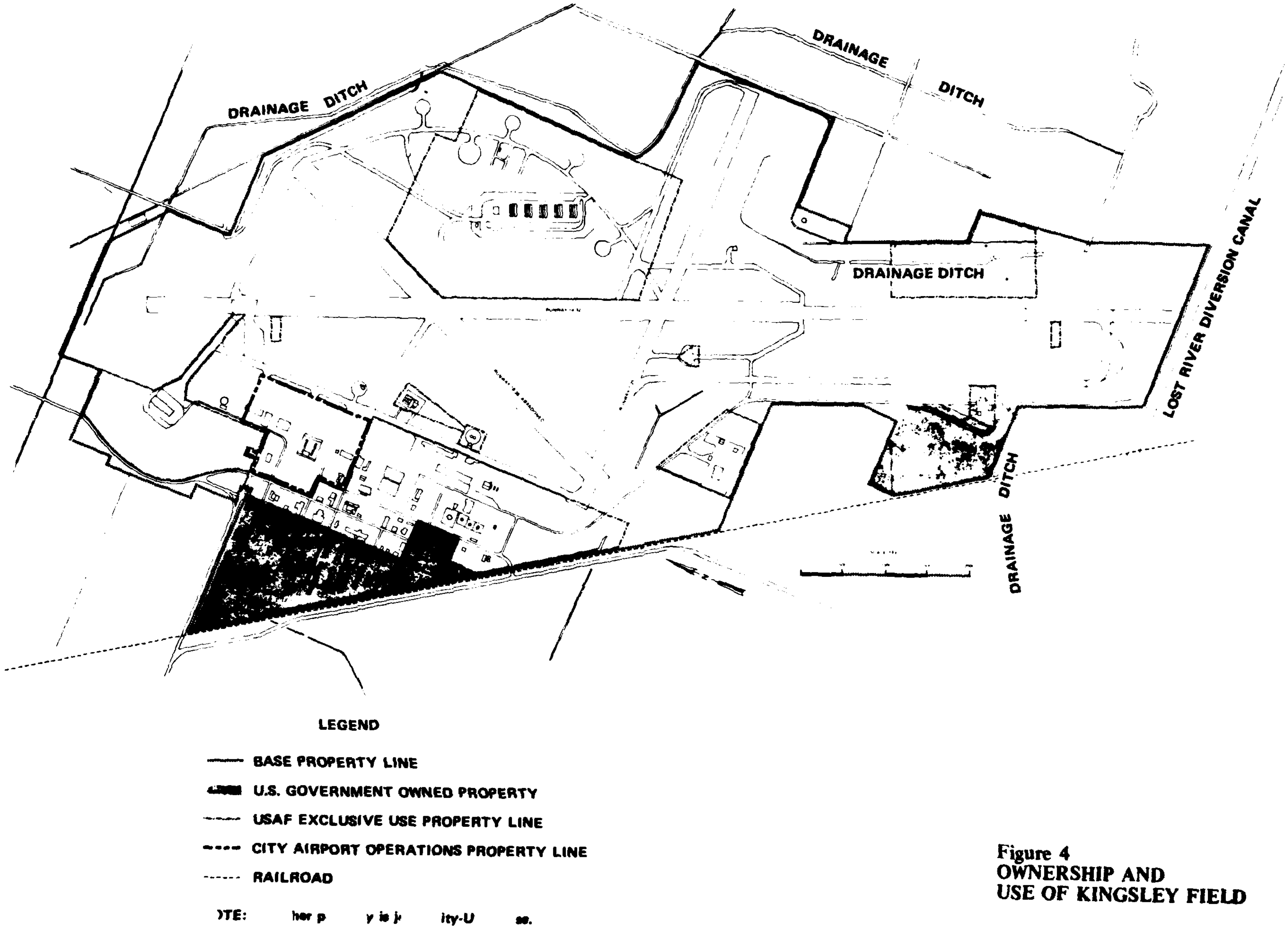


Figure 4
OWNERSHIP AND
USE OF KINGSLEY FIELD

B. Organization and Mission

Construction of Kingsley Field began in 1955 on a site that served as a naval air station during World War II and a municipal airport during the interim period from 1946 to 1955. Since its dedication in 1957, Kingsley Field has been used jointly by the Air Force and the City of Klamath Falls for fighter-interceptor and municipal airport operations, respectively. Keno AFS was constructed in 1958 to serve as radar site for backup intercept control (BUIC) in the area. Klamath AFS was activated in 1951 to host an aircraft warning and control radar squadron.

Although the aircraft numbers and types have fluctuated at Kingsley, the basic mission has always been to support NORAD and the Aerospace Defense Command. Prior to 1971, the mission was developed around active fighter interceptor squadrons to provide air defense of the Pacific Northwest. In 1971, the host fighter unit at Kingsley Field was deactivated, and the aircraft control and warning unit at Keno AFS became the Kingsley Field host unit with a primary mission of long-range radar and BUIC. In 1974, the BUIC facilities and functions were deactivated, and in 1978 control of the radar installation was shifted to the Federal Aviation Administration (FAA). Current activities at Kingsley Field include support for the Oregon Air National Guard's 142 Operating Location Alert Detachment; runway and taxiway maintenance; and provision of fire, crash, rescue, and emergency medical support for the airport.

A more detailed description of the field history and mission is included in Appendix C.

III. ENVIRONMENTAL SETTING

III. ENVIRONMENTAL SETTING

A. Meteorology

Kingsley Field is located in a semi-arid region having warm summers and cool winters with occasional periods of extreme cold. The field is located at an elevation of 4,100 feet, and air movement from the Pacific Ocean modifies the temperature extremes for both summer and winter. Moist air masses moving in from the ocean are lifted over the Coastal and Cascade mountain ranges before reaching Kingsley Field and, as a result, much of the moisture is already lost.

Mean annual precipitation at Klamath Falls is approximately 14.3 inches with 70 percent of the total occurring from October through March. Approximately 12 percent occurs from June through August. Much of the winter precipitation is in the form of snow. Annual lake evaporation is estimated to be approximately 42 to 48 inches.

Mean monthly temperatures range from 30°F in January to 68°F in July. The annual average daily variation is 25°F. Temperature extremes have ranged from a minimum of -24°F to a maximum of 105°F.

Table III-1 contains a summary of meteorological conditions in the vicinity of Kingsley Field.

B. Geology

Kingsley Field ~~is~~ located in a down-dropped valley (graben) typical of the basin and range physiographic province. The valley is separated from the surrounding hills by northwest/southeast-trending faults.

Table III-1
CLIMATOLOGICAL SUMMARY FOR KINGSLEY FIELD

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean	Average Length of Record (years)
Temperature														
Means[a]														
Daily Maximum (°F)	38.4	44.3	50.1	58.9	66.6	74.0	84.2	82.5	76.0	63.5	48.3	40.2	60.4	30
Daily Minimum (°F)	21.2	25.3	28.1	32.8	39.3	45.2	51.7	49.7	44.0	35.9	29.0	24.6	35.6	30
Monthly (°F)	29.8	34.8	39.1	45.9	53.0	59.6	68.0	66.1	60.0	49.7	38.7	32.4	48.1	30
Extremes[b]														
Record Highest (°F)	59	68	77	85	94	100	105	102	103	92	74	63	105	82
Record Lowest (°F)	-24	-10	-5	10	19	24	28	28	23	14	2	-16	-24	82
Precipitation														
Mean (in.)	2.05	1.41	1.15	0.73	1.13	0.92	0.26	0.58	0.57	1.21	1.77	2.53	14.31	30
Greatest Daily (in.)	2.40	1.70	1.60	0.92	1.05	1.45	1.37	2.01	2.34	1.75	1.68	2.58	2.58	82
Snow, Sleet, Hail														
Mean (in.)	14.9	6.2	4.4	1.6	0.2	T	0.0	0.0	T	0.3	5.9	9.1	42.6	30
Maximum Monthly (in.)	56.5	39.0	20.2	15.0	5.0	T	0.0	0.0	0.2	4.0	26.0	37.6	56.5	76
Greatest Daily (in.)	24.0	9.0	10.5	9.0	5.0	T	0.0	0.0	0.2	4.0	16.0	18.0	24.0	76
Mean No. of Days														
Precipitation 10 in. or more	6	4	4	3	4	3	1	1	1	3	5	6	41	30
Temperatures														
Max. 90°F and Above	0	0	0	0	0	2	6	5	2	0	0	0	15	30
Max. 32°F and Below	6	2	0.5	0	0	0	0	0	0	0	1	4	13	30
Min. 32°F and Below	28	24	22	15	6	1	0	0.5	1	9	20	27	153	30
Min. 0° and Below	1	0.5	0	0	0	0	0	0	0	0	0	0.5	1	30
Monthly Average[c]														
Relative Humidity at 4:00 a.m. (%)	79	81	77	74	78	80	76	80	77	78	81	83	79	10
Relative Humidity at 4:00 p.m. (%)	70	62	51	37	39	37	26	31	33	43	59	74	47	10
Prevailing Wind Direction	SSE	SSE	W	W	W	W	W	NNW	NNW	NNW	SSE	SSE	W	10
Average Wind Velocity (mph)	6.6	5.9	7.3	6.7	6.2	5.8	5.0	4.5	4.4	4.8	5.5	5.1	5.7	10

Source: U.S. Dept. of Commerce, Environmental Science Services Administration, 1969.

Note: Latitude: 42 degrees 13 minutes N
Longitude: 121 degrees 47 minutes W
Elev. (Ground): 4,090 Feet
T = Trace

[a]Period for Means: 1939 - 1968.

[b]Period for Extremes: 1884 - 1968.

[c]Klamath Falls Airport Data.

The airfield itself is located on a plain that slopes gently to the southeast. The nearest upland is Miller Hill, an up-faulted block, located approximately 1-1/2 miles southwest of the airfield. The airfield is located within the area that sporadically was covered by the ancestral Klamath Lake during the Pleistocene era. The stratigraphy beneath the airfield reflects this history.

The airfield is underlain by a thick sequence of poorly consolidated sedimentary rocks. The actual thickness is unknown, but geothermal test holes recently drilled near the airfield were over 1,500 feet deep without encountering bedrock. The sedimentary rocks that occur at the site are comprised of strata of silt, clay, and sand. The finer-grained clay and silt units were deposited in portions of the lake relatively far from the shore. The coarser sands were deposited near the lake shore or in streams above the ancestral lake. A test well drilled by the U.S. Geological Survey at Kingsley Field encountered materials typical of the area. A log of this well (designated No. 2) is presented in Appendix L.

The geologic structure of the Klamath Falls area is dominated by a number of northwest/southeast faults. Numerous faults strike north/south and a few strike northeast/southwest. These faults have no obvious surface expression in the valley floor areas. Faults are important conduits for the upward movement of geothermal water in many areas. No faults are known to occur on Air Force property; however, the existence of a fault a short distance northeast of the field is suggested by the shallow occurrence of geothermal water.

C. Hydrology

1. Surface Water

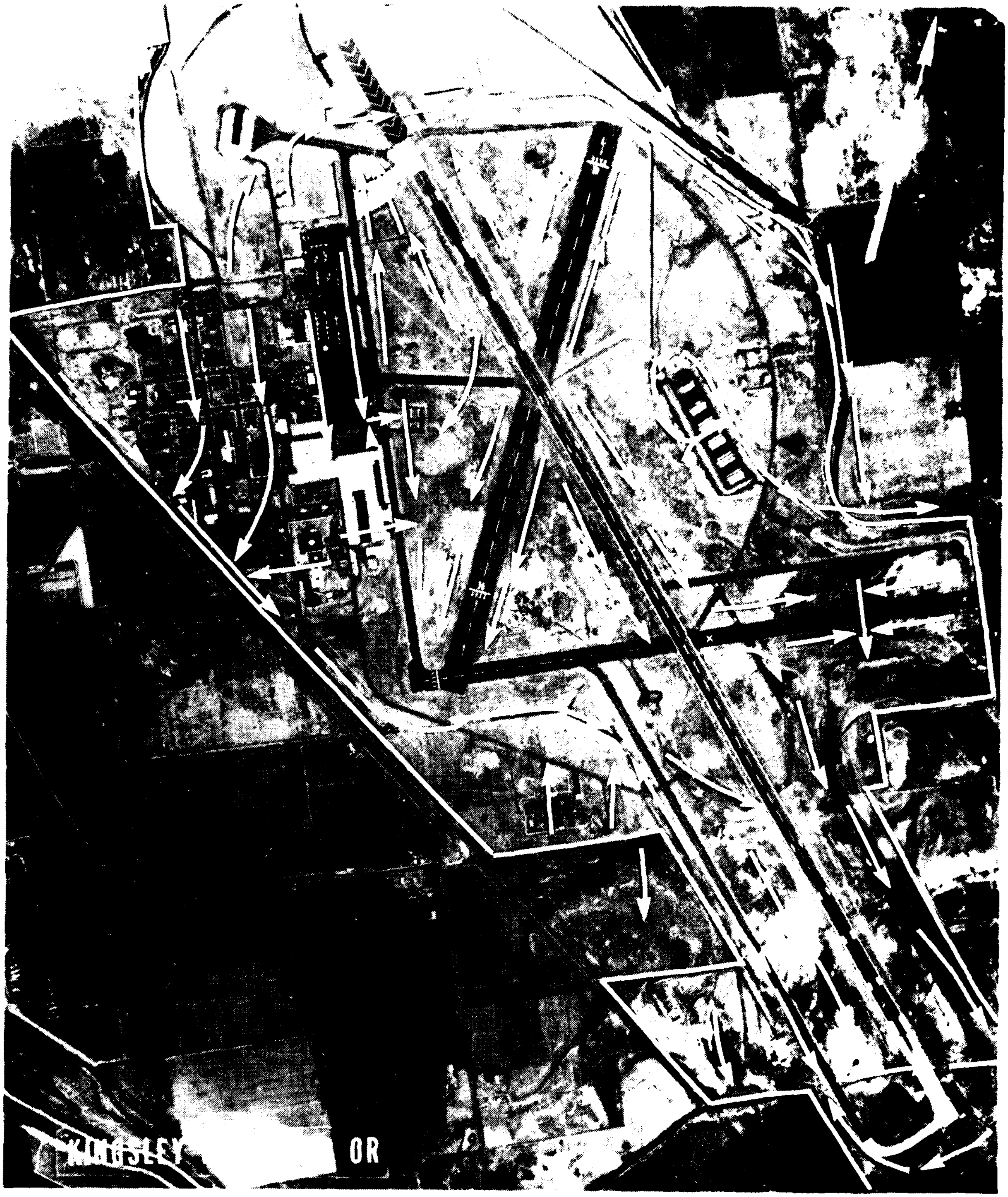
Kingsley Field is located within the Lost River drainage area. The natural drainage patterns have been

strongly modified by the construction of the Klamath project, a major irrigation and drainage ditch system operated by the Bureau of Reclamation. The surface drainage pattern of the airfield is shown in Figure 5. All of the surface runoff eventually reaches the major drainage ditches that flow through the airfield (Refer to Figure 4). Sewage treatment plant effluent is also collected in the drainage ditch system. These drain ditches discharge into the Lost River and flow southeast toward California (Refer to Figure 2). Lost River Diversion Canal (Figure 4) is a major hydrologic feature located just to the south of the major runway. This canal diverts water from the Lost River system to the Klamath system during the water-surplus (winter and spring) months of the year to minimize the surface water reaching Tule Lake. During the irrigation season, the flow in the canal is reversed; water is diverted from the Klamath River for irrigation in the Lost River and Tule Lake agricultural areas.

2. Groundwater

The Lost River Diversion Canal is a major hydrologic feature of the region, but has almost no influence on the surface hydrology of Kingsley Field. Water flow in the canal is perennial although the direction reverses. Seepage from the canal may cause some increase in groundwater levels near its course. This, in turn, could cause a small increase in discharge to the nearby drain ditches, which intercept the movement of shallow groundwater.

Kingsley Field is underlain by a thick sequence of sedimentary deposits ranging in size from clay to sand. The finer grained materials, clay and silt, are of low permeability and would not yield significant quantities of water to wells. The coarser materials (sands) are of relatively high permeability and can yield moderate quantities of water to



0 50 150 300

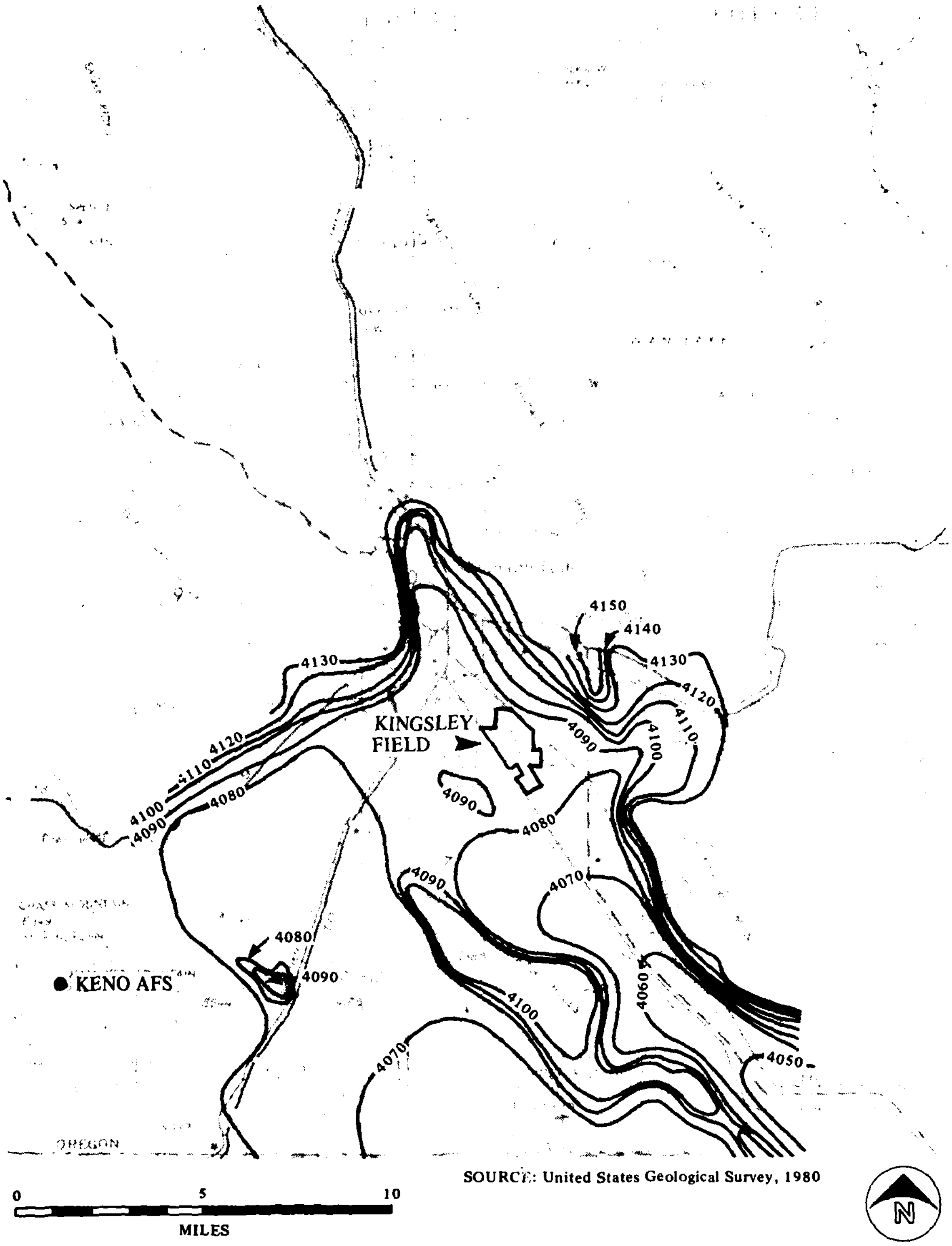
SCALE 1" = 150'

Figure 5
SURFACE DRAINAGE
KINGSLEY FIELD

wells. In the vicinity of Kingsley Field only a small amount of sand is present in the subsurface so that generally well yields are very low (see Appendix L for example well logs and locations). A 79-foot-deep test well drilled in 1961 about 500 feet east of the municipal airport terminal area yielded 200 gpm at a drawdown of about 25 feet. This well and other test borings near the 14-32 runway indicate the presence of a permeable, shallow aquifer at this location. The low yields of other nearby wells indicate that the sand encountered in these test wells is probably of limited areal extent, possibly representing an ancient river channel.

Groundwater levels are high in the vicinity of Kingsley Field, ranging from 2 to 10 feet below the ground. Under natural conditions, the groundwater levels probably would be even higher. The major drainage ditches effectively lower the water levels, however, and almost certainly control the direction of movement. Water contained in the drainage ditches does not exfiltrate into the groundwater. No water table measurements were made as a part of this project, but water level measurements made during a study performed in 1961 by Cornell, Howland, Hayes, and Merryfield suggested that groundwater flows in a southeasterly direction at Kingsley Field. The overall southeasterly direction of groundwater movement was confirmed by the USGS (Ref. 8). A groundwater-level map is presented as Figure 6. Near major drainage ditches, the regional groundwater gradient and direction are altered. In these areas, the shallow groundwater moves directly toward the drainage ditches and is discharged as surface water flow.

Groundwater quality in the vicinity of Kingsley Field is only of moderately good quality. No groundwater-quality analyses were available for wells on the field itself. Examination of the well logs shows that many owners of nearby



SOURCE: United States Geological Survey, 1980

Figure 6
GROUNDWATER CONTOURS
KINGSLEY FIELD, KENO AFS

wells report high concentrations of methane and/or iron in their water. The USGS sampled Well No. 13 in 1973. Field measurements of specific conductance and chloride indicated that the water quality in this well was poorer than that of other nearby wells. The specific conductance in this well was measured to be 1,850 mmho/cm, which is significantly greater than the values of 200, 530, and 645 measured in the other wells. The chloride concentration was reportedly 340 mg/l, which would be the highest measured in all of the Klamath Falls area. Discussion with USGS personnel indicated that this chloride measurement was made with a field testing kit so that its accuracy is doubtful.

The widespread occurrence of shallow low-permeability clay and silt strata tends to prevent movement of potentially contaminated shallow groundwater into deep aquifers. Where these shallow clay and silt strata are not present, or were removed as part of waste disposal operations, there is a potential for downward movement of contaminants into saturated sand strata.

D. Environmentally Sensitive Conditions

1. Habitat

Grounds surrounding base and city buildings are landscaped with species appropriate to this area, including grasses, juniper, and ponderosa pine. Lands adjacent to the base are principally agricultural, growing crops of various grasses used for either hay, pasture, or grain production. Refer to Appendix J for a listing of vegetation found within the base boundaries.

Wildlife found in the vicinity of Kingsley Field consists of both aquatic and terrestrial species (see Appendix J). The largest irrigation canal near the base, the

Lost River Diversion Canal, is expected to have small nongame fish species such as dace and chub. (Larger game fish are prevented from entering the canal by diversion structures.)

Most drainage and irrigation ditches on or in the vicinity of Kingsley Field are shallow, narrow waterways with limited value to most larger aquatic furbearers. The predominant users of these areas are expected to be amphibians such as pond turtles and frogs, reptiles such as salamanders and toads, and waterfowl (Appendix J).

The Pacific Flyway passes through the Kingsley Field area. There are important breeding grounds for pelicans, great blue herons, and cormorants west of Kingsley Field in marsh areas of the Klamath River. The larger canals and ditches on the base and ponds adjacent to the base serve as feeding and resting areas for several species of ducks and shorebirds.

Because of the extent of human development at Kingsley Field, both aquatic and terrestrial habitats have limited usefulness to wildlife.

2. Rare and Endangered Species

No detailed investigations have been made of threatened and endangered species at Kingsley Field. The following habitats and species were identified as occurring in the vicinity of the field:

A known nesting and wintering area for the protected bald eagle (*Haliaeetus leucocephalus*; U.S. Fish and Wildlife Service threatened) exists southeast of Hamaker Mountain in Bear Valley, approximately 8 miles southwest of the field.

Two other bird species listed as endangered by U.S. Fish and Wildlife have a range that includes the Klamath Falls Basin. They are the Aleutian Canada goose (Branta canadensis leucopareia) and the American peregrine falcon (Falco peregrinus anatum).

Two fish species, the shortnose (Chasmistes brevirostris) and Lost River sucker (Catostomus luxatus), are considered endangered by the State of California but not the State of Oregon. Preliminary studies indicate these species may be restricted to the Lost River (Figure 2) and its discharge point, the Clear Lake Reservoir in northern California.

One special plant species (Rorippa Calycina var. Columbial; U.S. Fish and Wildlife candidate threatened and Oregon priority two*) grows along an irrigation canal about 1 mile north of Kingsley Field.

3. Environmental Stress

Vegetation control, accomplished by mowing, is the predominant factor in limiting wildlife populations within the Kingsley Field boundaries. Significant vegetational stress was not observed on or within the vicinity of the field.

Relatively low precipitation and moderately high evaporation rates limit the driving forces available for contaminant migration. The groundwater level is high but movement from the area is slow. Drainage ditches running through the field intercept shallow groundwater flow and drain into the Lost River. The Lost River may contain a species of fish listed endangered by the State of California, but no evidence of contamination was discovered.

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*Priority one: Possible extinction within 5 years.
Priority two: Possible extinction within 20 to 25 years.

IV. FINDINGS

IV. FINDINGS

A. Activity Review

1. General

Major activities at Kingsley Field that have contributed to the generation of potentially hazardous wastes include vehicle, ground support equipment, and aircraft maintenance. Other waste-generating activities have included small arms munitions disposal, pest control, hobby-scale photo development, and fuels laboratory analyses.

2. Industrial Operations

Kingsley Field is jointly used by the Air Force, the City of Klamath Falls, the Air National Guard, the U.S. Forest Service, Klamath County Vector Control, and various private tenants. Air Force industrial activities have been at a reduced level since the departure of the host fighter squadron in 1971. Even during peak periods, however, the field reportedly maintained less than 20 aircraft, which is a relatively small number compared to bases having major squadron support activities.

A list of Air Force industrial facilities and activities identified in the Records Search is presented in Appendix D. Maintenance operations have always been of a routine nature with major re-work and corrosion control activities accomplished at other bases.

No records were available on the types of solvents used at the field but, typically, these would consist of trichlorethane, trichloroethylene, methyl ethyl ketone, and toluene. Wastes generated by the maintenance operations

would have included spent solvents and waste oils, greases, and fuels removed from the equipment. Paint chips, waste paint, thinners, and spent solvents would have been generated by building maintenance and limited corrosion control activities. Aircraft and vehicle washrack activities would have resulted in the discharge of alkaline soaps, detergents, and a small amount of PD-680 (see Appendix M).

3. Fuels Storage and Maintenance

Tanks currently used for POL storage are listed in Appendix E. Abandoned fuel storage tanks are included in Appendix F. The major POL storage facilities were provided for JP-4 jet fuel. Leaded gasoline storage for motor vehicles, diesel oil storage for heating equipment and trucks, and fuel oil storage for heating are also provided. Aircraft fueling operations have always been conducted using refueling trucks.

The POL storage tanks are "glass" lined and have cathodic protection. Except for the two events reported in the disposal site identification section, tank and pipeline leakage has been minimal and is not considered to be a significant source of contamination. According to the available records and interviews, POL tank sludge removal and disposal has only been required once at the field (in 1969). No information was available on where this sludge was disposed of.

4. PCB Disposal

PCB's are not considered to present a significant contamination problem because of the small quantities involved. No transformers at Kingsley Field have been identified as containing high levels of PCB. It is possible that many of

the older transformers do contain low levels of PCB. Since 1972, transformers have been stored behind Building 224 prior to disposal off site. Minor transformer oil spills have occurred in that area. Reportedly, only five to ten transformers have had oil changes since the base was activated. The small volumes (less than 1 gallon) of spent oils were emptied onto the ground at the various transformer locations.

5. Pesticide Usage

Herbicides and other pesticides are applied on base for weed and pest control (Refer to Appendix K). Chemicals currently in use include malathion, 2,4-D, and monuron. The use of DDT was discontinued in the early 1960's.

Herbicides are applied to land adjacent to runways, POL storage areas, fence lines, and transformer pads. Insecticides and rodenticides are used as required.

Herbicides and other pesticides are stored in Building 227. Operations have not resulted in excessive amounts of pesticide disposal. From 1957 until 1978, full containers of unusable pesticides were occasionally dumped into the base landfill (approximately 10 small containers per year. Small amounts of DDT might have been disposed of in these landfills prior to the early 1960's. At the time of the Air Force ban on DDT use, the bulk of the Kingsley Field DDT supply was given to the county.

Detailed descriptions of Kingsley Field pesticide operations and currently stored chemicals are unavailable. Current directives call for the use of 2,4-D and monuron for the control of weeds and cite the Oregon Insect Control Handbook for the control of insects.

Crop duster and vector control operations on base property are discussed in section 7 below.

6. Wastewater Collection and Treatment

No industrial wastewaters have been discharged directly into the storm drainage system at Kingsley Field. Potential contamination of the surface stormwater runoff could occur when flowing through the industrial areas, but the degree of contamination is considered insignificant because of the small quantities of waste involved. Miscellaneous dumping of small quantities of industrial wastes into the storm drains has probably occurred, but, again, the degree of contamination is considered insignificant because of the small quantities. No environmental stress resulting from possible industrial waste discharge to the storm drain was observed.

Sanitary and shop wastes are collected in the sanitary sewer system and treated in a city owned and operated secondary sewage treatment plant. Typical industrial wastes collected in the sanitary sewer include miscellaneous paints and solvents, oils, cleaners, and degreasers from the various maintenance activities. An oil recovery program was conducted from 1965 until 1972 to reduce the discharge of waste POL. Oil/water separators, listed in Appendix G, are also used to reduce the flow of POL to the sanitary system. No instances of sanitary sludge disposal on base were reported. Septic tank systems were provided for several facilities; but the volume of industrial or potentially hazardous wastes discharged to those systems was minimal, and no significant contamination is expected.

7. Other Activities

Inert munitions residue from the small-arms range was disposed of in the on-base landfills. No evidence was found concerning the use or manufacture of biological agents. Operation of the heating plant has resulted in the production of 12 to 20 cubic yards per week of fly ash, which is not considered hazardous. Coal was burned until 1978 and wood afterward. The ash has been disposed of in several areas as identified in Section IV-B.

The major hazardous-waste-producing activities on Kingsley Field are washdown and improper pesticide storage at a private crop duster operation and at Klamath County Vector Control. The Air Force has no control over these activities. They are regulated by the local government and the Oregon State Department of Ecology. This site is further described in Section IV-B.

8. Summary of Waste Disposal Practices

Prior to 1979, essentially all of the solid wastes generated, except for those originating in the mess hall, were disposed of on base property. The mess hall wastes were transported off base. Since then, all of the wastes have been hauled off site. Each of the base landfill areas is a trench-type landfill. Open burning was conducted at two of the landfill sites.

The majority of waste POL was burned in the fire training area. A relatively small amount has been disposed of in two of the landfill areas and to the storm drainage system. Currently, all waste oils are used for fire training.

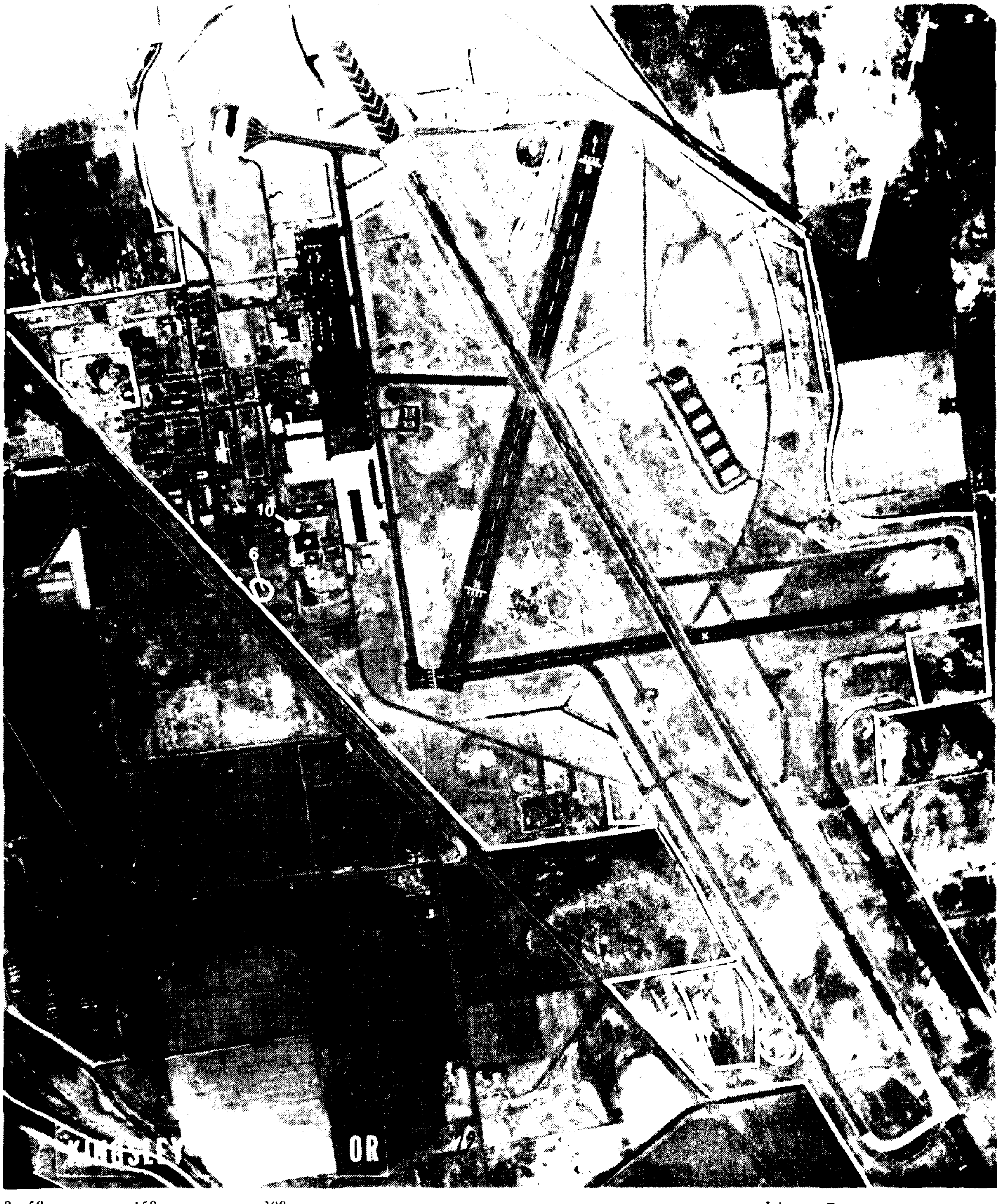
B. Disposal Sites Identification and Rating

Interviews with 15 past and present base personnel resulted in the identification of 12 disposal sites at Kingsley Field and two disposal sites at Keno AFS. The sites included one current and two former landfills, two inactive and two active miscellaneous solid waste burial sites, six liquid disposal or spill areas, and one crop duster washdown area that is partially on Kingsley Field property but is not controlled or managed by the Air Force. Kingsley Field sites are shown in Figure 7. Approximate dates of major disposal site usage are shown in Figure 8.

The following is a brief description of each site identified during the Records Search at Kingsley Field and the rationale used for eliminating or rating each site. The sites identified at Keno AFS are shown and discussed in Section VII.

- Site No. 1 - Original base landfill located northeast of the ammo storage area on joint-use property. The site was used by the Navy during World War II for miscellaneous dumping and by the Air Force in 1956 and early 1957 for the disposal of domestic refuse, trash, and some equipment parts. Industrial activity at the field was low during this period, and essentially no POL was disposed of in the fill. No further rating of this site is required because the characteristics of the wastes disposed of are not considered hazardous and no threat of contamination exists.

- Site No. 2 - Base landfill located east of the existing skeet range on joint-use property. This site was used from 1957 to 1961 for the disposal



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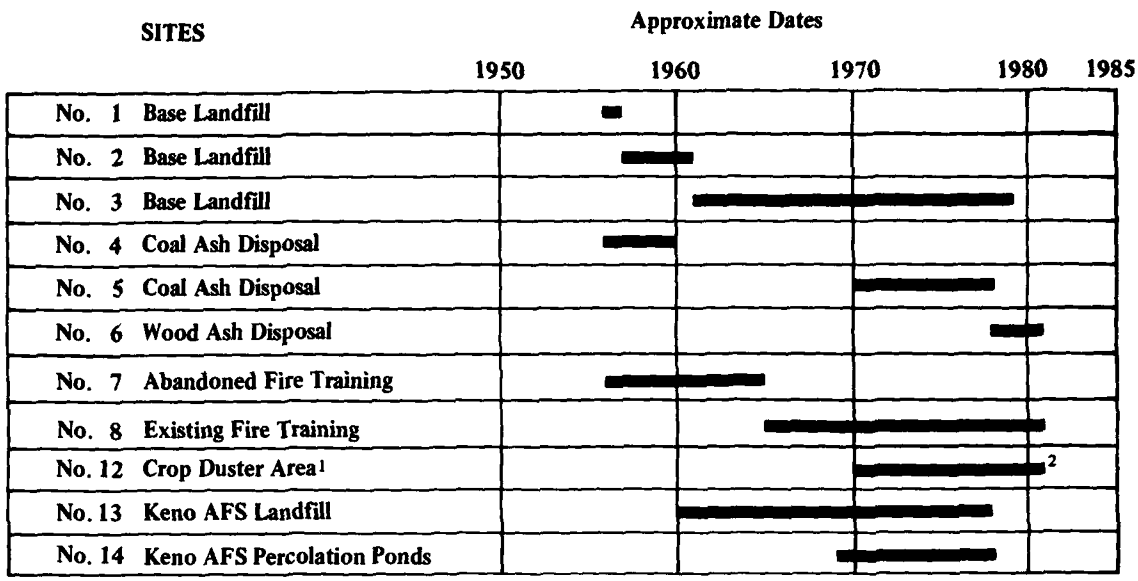
SCALE 1" = 150'

Figure 7
WASTE DISPOSAL SITES
KINGSLEY FIELD



[1] Not considered Air Force responsibility - included for informational purposes only

[2] In present location - crop duster activities noted since 1949

Figure 8
HISTORICAL SUMMARY OF ACTIVITIES AT MAJOR DISPOSAL SITES KINGSLEY FIELD, KENO AFS

of mess hall wastes; general base trash and refuse, housing area garbage, unrinsed and possibly full 5-gallon pesticide containers, and 5 to 10 cubic yards per year of paint, thinner, and solvent containers. Coal fly ash was buried in the fill from 1960 to 1970. The total volume of potentially hazardous wastes disposed of in the fill is relatively low, but the potential for groundwater contamination and contaminant migration exists because of the immersion of a large portion of the fill. Further rating of the site is considered necessary.

- Site No. 3 - Most recent base landfill located south of Runway 25 on joint-use property. The fill was used from 1961 through 1979 for the disposal of miscellaneous base wastes and is currently used for the disposal of demolition debris. Since 1963, all mess hall and housing area wastes have been hauled off site. Approximately 75 percent of the 12,000 cubic yards per year of base wastes have been hauled off site since 1965. This fill was reported to contain unrinsed pesticide containers; as much as 1 cubic yard of DDT; approximately 1-1/2 cubic yards of medical wastes; paint, thinner, and solvent containers; and general refuse. The site has served as the major coal fly ash disposal site since 1960. Further rating of the site is warranted because of the moderate volumes of potentially hazardous wastes disposed of and the resulting threat of groundwater contamination and contaminant migration due to partial immersion of the fill.

- Site No. 4 - Coal fly ash disposal site located at the base recreation area ball field on USAF property. The site was used for ash and demolition debris disposal from 1956 to 1960. The ash layer reportedly runs from 1 to 4 feet thick over the 3/4-acre site. The characteristics of this waste are not considered hazardous, and groundwater contamination is not anticipated. No further rating is warranted for this site.

- Site No. 5 - Coal fly ash disposal site located northwest of the engine test cell facility on joint-use property. This site was used for ash and demolition debris disposal from 1970 until 1978 when the heating plant was converted for wood fuel. The characteristics of this waste are not considered hazardous, and groundwater contamination is not anticipated. No further rating is warranted for this site.

- Site No. 6 - Wood fly ash disposal site located near the heating plant on USAF property. This site was used for wood fly ash disposal since 1978 and is currently active. The characteristics of this waste are not considered hazardous, and no groundwater contamination is anticipated. No further rating is warranted for this site.

- Site No. 7 - Abandoned fire training area located in area currently occupied by Klamath County Vector Control building northeast of Runway 14 on joint-use property. Approximately 5,000 to 8,000 gallons per year of waste oils, contaminated fuels, and POL were burned at this site from 1956 until 1965. The majority of the potentially hazardous substances

were destroyed by burning, and a relatively impermeable paving covers the site. The probability of current groundwater contamination or contaminant migration resulting from past fire training excercises is considered low because of the time span since the site was used. No further rating is required.

- Site No. 8 - Existing fire training area located east of the county vector control facility on joint-use property. From 1965 until 1972, approximately 5,000 to 8,000 gallons per year of waste or contaminated fuels and POL were burned at this site. Since 1972, the quantity has decreased to less than 100 gallons per month. The area is currently used and exposed to precipitation and runoff. Groundwater contamination by potentially hazardous substances and contaminant migration are possible, and the area warrants further rating.

- Site No. 9 - Engine test cell facility located west of the taxiway for Runway 32 USAF exclusive-use property. The test cell was used from approximately 1956 until 1972 for jet engine test firings. Minor fuel and POL spills have resulted from these firings; but because of the relatively small quantities of potentially hazardous substances, no ground or surface water contamination is expected. No signs of environmental stress were observed and further rating of this site is not warranted.

- Site No. 10 - Fuel spill in POL storage area on USAF property. In 1975 approximately 3,000 gallons of jet fuel were spilled while loading a refueling truck. The spill was contained and allowed to

evaporate and percolate into the surrounding soil. The volume spilled was relatively low, and the fuel would have been kept near the surface for maximum evaporation because of the high water table. Possible groundwater contamination and contaminant migration resulting from this spill would no longer be evident. No further rating is considered necessary.

- Site No. 11 - Oil spill west of alert facility on USAF exclusive-use property. Reportedly, 10,000 gallons of diesel oil were spilled in 1977 because of the rupture of a line leading from an oil storage tank. No evidence of the spill was observed on the surface at the time it occurred. Because of the potential contamination of the groundwater and possible contaminant migration, further rating of this site is warranted.

- Site No. 12 - Crop duster washdown and pesticide storage area located northeast of Runway 14 on the north boundary line on joint-use property. This area has been used for crop duster and wing tank washdown since 1970. The areas used from 1949 until 1970 were not identified. Klamath County Vector Control uses the site as an operations staging area and for pesticide storage. Full and partially full containers of malathion were noted, as were several empty barrels.

  Crop duster operations have existed on the airfield since 1949 in various locations but have not been managed by the Air Force. The presence of surface deposits resembling pesticide/herbicide residues and direct connection of wash area to drainage

ditches indicate that the area may be a significant source of contamination. Regulation of these current operations is the responsibility of the local government and State Department of Environmental Quality. Groundwater and surface water contamination is anticipated along with migration of the contaminants, but the site is not considered to be the responsibility of the Air Force and subsequently is not rated.

Site rating using the modified JRB Associates system was conducted on those sites considered to have the potential for hazardous waste migration. A complete listing of disposal sites is presented in Table IV-1. Sites determined to require numerical rating are so indicated. The Keno AFS sites presented here are discussed in Section VII.

The rating system consists of 26 rating factors that are divided into four categories: receptors, pathways, waste characteristics, and waste management practices that are used to evaluate the principal targets of contamination, the mechanisms for migration, the hazards posed by the contaminants, and the facility's design and operation, respectively. Relative scores from each category are combined to give an overall score using appropriate weighting factors. A more detailed description of this hazard rating methodology is included in Appendix H.

Numerical results for each rated site are presented in Table IV-2. Copies of the rating forms for each site are included in Appendix I.

Table IV-1
DISPOSAL SITE RATING SUMMARY

Site	Waste Type	Potential Hazards		Numerical Rating
		Contamination	Migration	
1	Domestic/Debris	No	N.A.	No
2	Industrial/Domestic	Yes	Yes	Yes
3	Industrial/Domestic	Yes	Yes	Yes
4	Ash	No	N.A.	No
5	Ash	No	N.A.	No
6	Ash	No	N.A.	No
7	Fuels/Oils	Yes	No[b]	No
8	Fuels/Oils	Yes	Yes	Yes
9	Fuels/Oils	No[a]	N.A.	No
10	Fuel	Yes	No[b]	No
11	Oil	Yes	Yes	Yes
12	Pesticides	Yes	Yes	No[c]
Keno AFS				
1	Domestic/Debris	No	N.A.	No
2	Sanitary Sewage	No	N.A.	No

N.A. - Not applicable using decision tree methodology.

[a]Hazardous wastes not generated in quantity sufficient for contamination.

[b]No current migration caused by past potential contamination.

[c]Not considered responsibility of Air Force.

Table IV-2
SUMMARY OF SITE ASSESSMENT RESULTS

Site	Site Description (weighting factor)	Subscores (percent of maximum possible score in each category) Receptors	Pathways	Waste Characteristic	Waste Management Practices	Overall Score (weighted average)
2	Base landfill	40	26	50	67	45
3	Base landfill	53	51	90	74	66
8	Exst. fire training	40	28	60	60	46
11	Diesel oil spill	40	26	50	60	43

V. CONCLUSIONS

V. CONCLUSIONS

A. No direct evidence was found to indicate that migration of hazardous contaminants beyond Kingsley Field property exists. On-site investigations and review of available information on Kingsley Field revealed no significant environmental stress caused by U.S. Air Force hazardous waste disposal.

B. Information obtained through interviews with 15 past and present base personnel and field observation indicates that small quantities of hazardous wastes (primarily waste oils and solvents) have been disposed of on Air Force property at Kingsley Field in the past.

C. Industrial activity at Kingsley Field consists primarily of routine vehicle maintenance. Prior to 1972, routine aircraft maintenance for a relatively small squadron was conducted. Generation of large quantities of hazardous wastes has not occurred in comparison to bases having significant aircraft rework and maintenance missions. As a result, the potential for large-scale contamination problems is considered to be relatively low.

D. Portions of the major landfills are below the groundwater table, and some degree of contamination is likely. Low precipitation, high potential evaporation rates, and low groundwater gradients reduce the potential for contaminant migration from these sites.

E. Drainage ditches located in and near Kingsley Field intercept shallow groundwater on most of the field. Widespread occurrence of shallow, low-permeability clay and silt strata tends to prevent the movement of shallow groundwater into deeper aquifers. Where these strata

were removed during waste disposal operations the potential exists for contaminant migration into the saturated sand strata and deeper aquifers.

F. Indirect evidence of hazardous groundwater contamination (high specific conductance and chlorides) was indicated by water quality analyses for a well located near Base Landfill No. 3. The potential groundwater contamination may be due to landfill activities because of the probable direction of groundwater movement from the landfill to the well.

G. Table V-1 presents a priority listing of the rated sites and their overall scores. Although the crop duster washdown area is considered to be the most significant contamination source, the Air Force has no control over the area and it is not rated.

The potential exists for hazardous contaminant migration from the base landfill (Site No. 3). The existing fire training area, another base landfill, and a diesel oil spill area (Sites No. 8, 2, and 11) are not considered to be major problem areas because of the quantities of potentially hazardous wastes and the relative lack of migration pathways and receptors.

The remaining sites are not considered to present a significant migration hazard. Transport of hazardous debris through surface erosion is not anticipated.

Table V-1
PRIORITY LISTING OF DISPOSAL SITES

Site Number	Description	Overall Score
3	Base landfill	66
8	Exst. fire training	46
2	Base landfill	45
11	Diesel oil spill	43

VI. RECOMMENDATIONS

VI. RECOMMENDATIONS

A. Indications of potential contaminant migration from Site No. 3 were found, and limited monitoring is recommended to verify that hazardous contaminant migration is not occurring and to ensure that private water supplies located near the well are protected. This limited program should be conducted as early in Phase II as possible.

B. Specifically, two groundwater monitoring wells with depths equal to the depths of the nearby private wells (60-foot maximum) should be installed down-gradient (southeast) from Site No. 3 along the perimeter road. A background groundwater-quality monitoring well of similar depth should be installed immediately up-gradient (northwest) from the fill.

The wells should be sampled and analyzed for the following constituents:

- total organic carbon (TOC)
- chemical oxygen demand (COD)
- oil and grease
- pH
- specific conductance
- chloride

C. If possible, samples should be obtained from the private water wells located southeast of Site No. 3. These samples should be analyzed for the previously listed constituents.

D. Should the results from these tests indicate that contaminant migration may be occurring, samples should be obtained from the monitoring wells (and private wells, if possible) and analyzed for DDT, trichloroethylene, methyl ethyl ketone, and total phenols.

E. If significant hazardous contaminant migration is observed when sampling the monitoring wells at Site No. 3, the installation of monitoring wells at Sites No. 10 and 2 is recommended.

F. Klamath County Vector Control and the Oregon State Department of Ecology should be notified of the potential contaminant migration problem caused by washdown of the privately owned crop dusters. More detailed evaluation of the potential hazard should be encouraged.

G. Specific details of the limited follow-on Phase II program outlined above, including the exact location and depth of monitoring wells, should be finalized during the initial stages of Phase II. It is not the intent of this report to assess the exact depth or location of any monitoring wells. In the event that contaminants are detected in the water samples collected from any of the wells, a more extensive field survey program should be implemented to determine the extent of the contaminant migration. The Phase II Contractor should be responsible for evaluating the results of the program outlined above and for recommending additional monitoring, as appropriate.

VII. KENO AIR FORCE STATION

VII. KENO AIR FORCE STATION

A. Description

Keno AFS is located on a 289-acre site on Hamaker Mountain approximately 10 miles southwest of Kingsley Field. The station occupies 12 of the 39 acres of land owned by the Air Force.

Keno AFS has served as a radar installation since its construction in 1958. Backup intercept control facilities were active from 1964 until 1974. The BUIC system was dismantled and removed in 1977. In 1978, control of the station was transferred to the FAA.

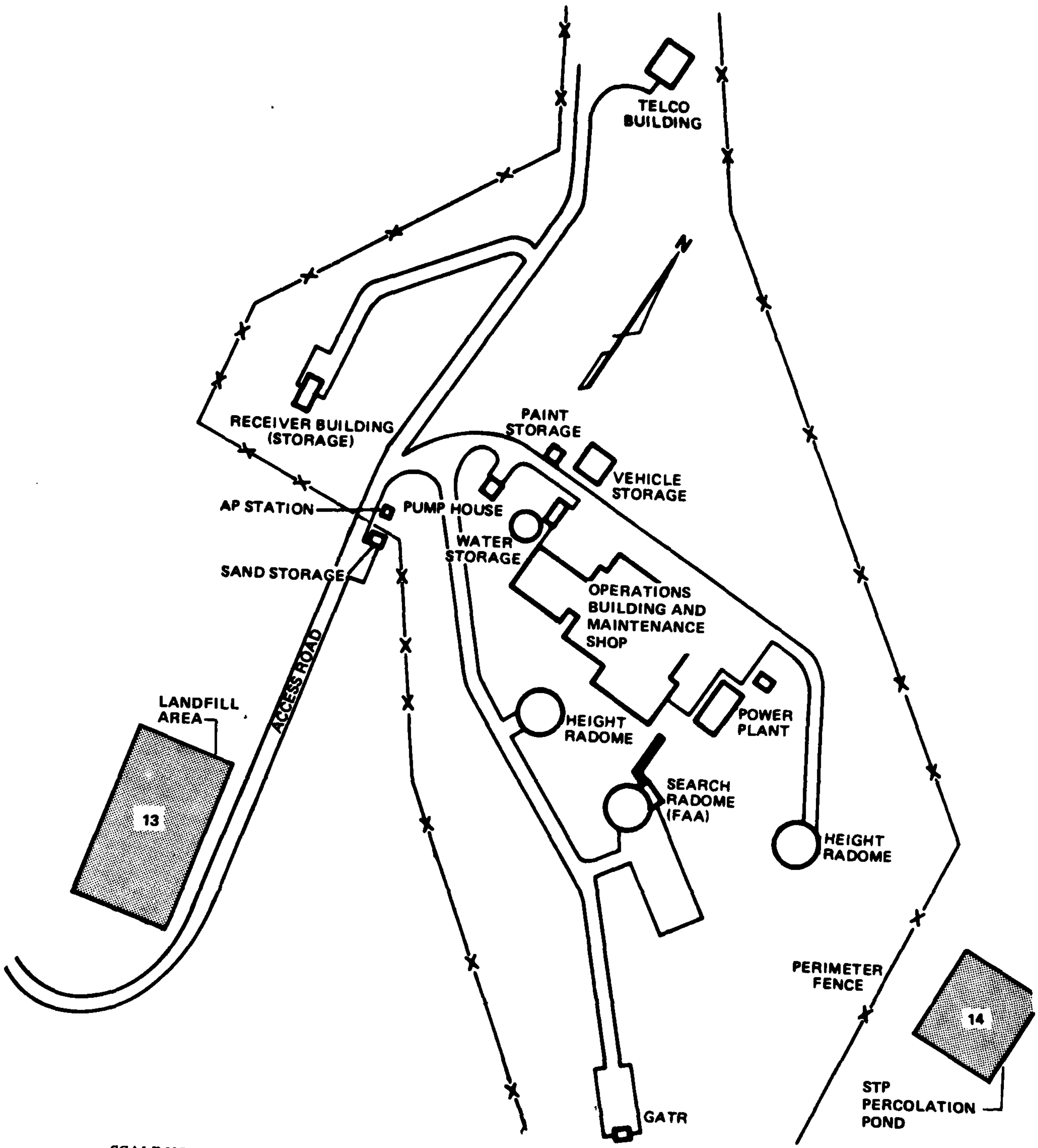
The site, consisting of six buildings and three radar domes, is enclosed by a chain link fence. Three of the buildings and two of the radar domes are not currently used. Electric power is generated on site by diesel-powered generators with a 600-kW capacity. Water is obtained from an on-site well, and wastewaters are collected and treated on site. Sanitary sewage effluent is discharged to a percolation pond for disposal.

A listing of industrial facilities located at Keno AFS is included in Table D-1, Appendix D. The station is shown in Figure 9.

B. Environmental Setting

1. Geology and Hydrology

The Keno radar station is located atop Hamaker Mountain, an extinct volcano. Little is known about the detailed geology of Hamaker Mountain, but, typically, rocks



SCALE NOT AVAILABLE

Figure 9
SITE PLAN
KENO AFS

near eruptive centers are highly fractured and contain numerous beds of fragmental volcanic rocks. These fractured and fragmented rocks can be highly permeable and, where saturated, can yield large quantities of water to wells. No surface streams are known to exist at the station. Most of the precipitation that falls at the station is likely to infiltrate and eventually reach the groundwater.

Although the water supply is reportedly obtained from on-site wells, no information is available on yield or depth. No well logs are on file with the State of Oregon.

The rate and direction of movement of groundwater from the radar station is unknown.

2. Environmentally Sensitive Conditions

Little native vegetation exists within the fenced area of Keno AFS. The forested habitat surrounding the station is primarily comprised of ponderosa pine, lodgepole pine, and white fir with an understory of manzanita. Mullein is common along roadsides and in other disturbed areas such as the landfill site and sewage treatment plant percolation pond (empty at the time of this survey).

The forested lands surrounding Keno AFS are expected to support wildlife populations because of the relatively low level of human activity and development on Hamaker Mountain. Large species such as mule deer, black tail deer, and bobcat, in addition to smaller species such as raccoon, ground squirrel, and jack rabbit, are probable inhabitants of this area.

Bear Valley lies 8 miles southeast of the station and is a known wintering and nesting area for the protected bald eagle (*Haliaeetus leucocephalus*; USFWS threatened).

Bear Valley lies in the drainage pattern for runoff from half of Keno AFS, including the STP percolation pond. An on-site investigation and records search did not indicate hazardous contamination or migration of contaminants from the station.

C. Findings

Two waste disposal sites were identified at Keno AFS. A short description of each site and the rationale used in determining whether subsequent rating was needed follow.

- Site No. 13 - Station landfill located adjacent to the road leading into the facility. This site was used primarily for the disposal of packing crates and nonputrescible materials from 1960 until 1978. No industrial or maintenance activities were conducted at the station that resulted in the generation of significant quantities of hazardous wastes, and the characteristics of the wastes disposed of do not present a groundwater contamination hazard. No further rating is warranted for this site.

- Site No. 14 - STP percolation ponds located south of the facility. Used for sanitary sewage disposal from 1969 until 1978. The nonhazardous characteristics of the wastes disposed of do not present a groundwater contamination hazard, and no further rating is needed.

D. Conclusions

1. No direct evidence of hazardous waste contamination or contaminant migration was discovered at Keno AFS.

2. Activities at Keno AFS have not resulted in the generation of significant quantities of potentially hazardous wastes.

3. No signs of environmental stress resulting from past waste disposal activities were observed.

4. No well logs for the on-site wells were available, and the rate and direction of movement and depth of the groundwater are unknown.

E. Recommendations

No hazardous contamination or contaminant migration is indicated at Keno AFS, and no monitoring or analyses are recommended.

VIII. KLAMATH AIR FORCE STATION

VIII. KLAMATH AIR FORCE STATION

A. Description

Klamath AFS is a 155-acre radar facility located approximately 20 miles south of Crescent City near the California coast. The station was constructed in 1951. A more detailed history of the station is included in Appendix C.

A site plan is shown in Figure 10. Detailed facility information was not available, but those industrial facilities that could be identified are listed in Table D-1, Appendix D.

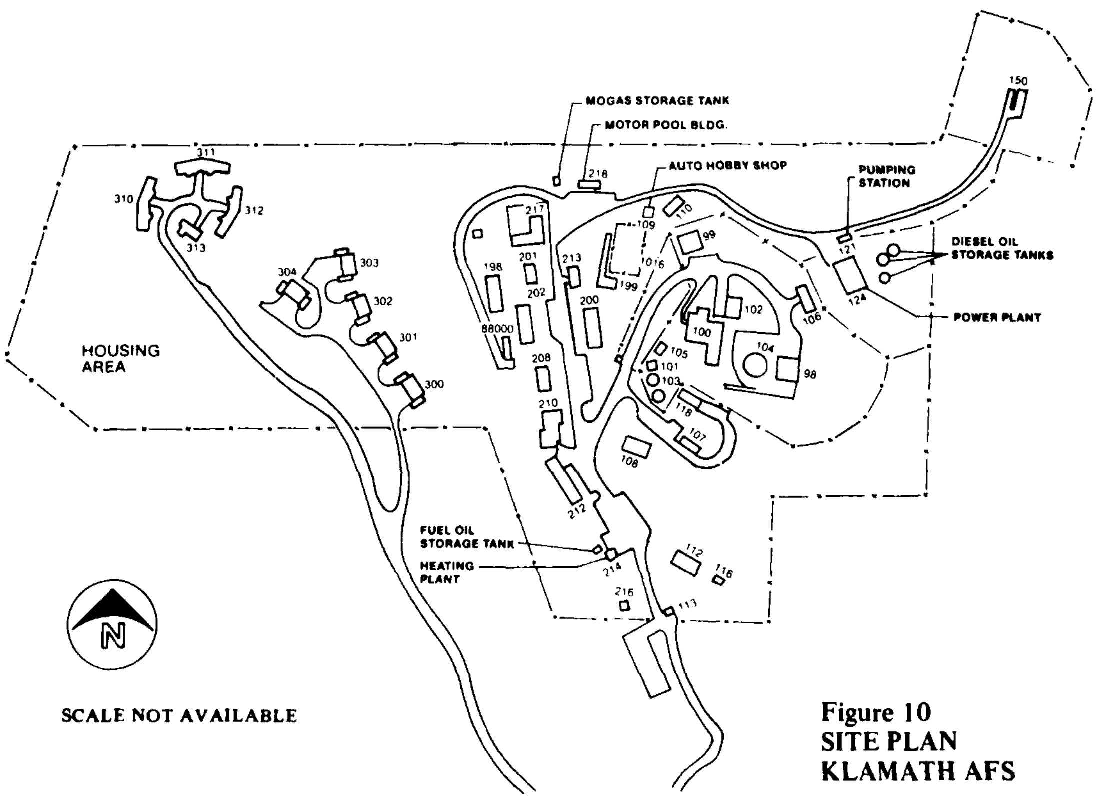


Figure 10
SITE PLAN
KLAMATH AFS

Power is supplied to the station using three 650-kW and two 400-kW on-site diesel-powered generators. Heat is furnished by a 4201 MBTU/hr central steam heating plant that uses diesel oil for a fuel source. Motor vehicle maintenance is provided at the motor pool and auto hobby shop. Water is supplied from a nearby creek and undergoes chemical treatment and filtration at an on-site treatment plant. For the past 10 years wastewater treatment has been provided by an on-site activated sludge package plant. Prior to that time a septic tank system was in operation.

B. Environmental Setting

1. Geology and Hydrology

The Klamath Air Force Station is located on a bluff 1-1/2 miles north of the mouth of the Klamath River. The station is underlain by rocks of the Franciscan formation, a complexly folded and sheared mass of greywacke, shale, conglomerate, chert, and altered volcanic rocks. The Franciscan formation is usually considered nonwater bearing but, where fractured, can yield small quantities of water to wells. The water-bearing characteristics of the materials at the Klamath AFS are unknown.

The water supply is obtained from surface water, and no specific information is available on subsurface conditions. The rate and direction of movement of groundwater from the radar station are unknown.

2. Environmentally Sensitive Conditions

Klamath AFS lies on an ocean-facing slope in the Pacific coastal vegetation region. Dense brushfields frequently grow on mountain slopes such as this. They contain

species such as cow parsnip, wax myrtle, and California blade berry. The coniferous forest begins inland from the brush-fields with the dominant species being the redwood. Roosevelt elk and Columbian black-tailed deer, in addition to various small mammals, birds, reptiles, and amphibians, are probable inhabitants of this region.

No detailed report was available on protected species at Klamath AFS, but Federally protected species that might occur in the vicinity of Klamath AFS are: Southern sea otter (Enhydra lutris nereis; threatened), bald eagle (Haliaeetus leucocephalus; endangered), American peregrine falcon (Falco peregrinus anatum; endangered), Aleutian Canada goose (Branta canadensis leucopareia; endangered), and brown pelican (Pelecanus occidentalis; endangered).

C. Findings

Currently, Klamath AFS is on inactive status and the actual levels of facility use are low. Information obtained through telephone interviews with personnel associated with Klamath AFS indicates that a waste disposal area was never provided on site.

No information was available concerning the industrial wastes that might have been discharged to the sewage treatment plant, but a review of base facilities indicates that the quantity of potentially hazardous wastes should have been small. Water and sewage treatment sludges were disposed of at Crescent City's sanitary landfill. Again, the quantity of potentially hazardous wastes disposed of on base would have been small, and no significant migration of the contaminants is anticipated.

In 1979, a barrel of transformer oils containing PCB was dropped from a truck approximately 3/4 mile from the station. Cleanup activities were undertaken, and the site no longer presents a hazard. No information was available concerning on-site spills of potentially hazardous wastes.

D. Conclusions

Detailed information on Klamath AFS waste disposal activities was not available, and no on-site disposal facilities were identified. Generation of significant quantities of potentially hazardous wastes was unlikely because of the limited on-site industrial activities. Hazardous contamination and contaminant migration are not anticipated based on the available information.

No information was available on subsurface conditions or the rate and direction of groundwater movement.

E. Recommendations

Based on the information available to the study team, there is no indication of a potential contamination or migration problem, and no Phase II monitoring is recommended for Klamath AFS.

IX. OTHER OFF-BASE FACILITIES

IX. OTHER OFF-BASE FACILITIES

The Falcon Heights family housing annex was the other off-base facility identified in the statement of work for the Kingsley Field Records Search. No waste disposal activities were identified at the site, which is located approximately 2 miles south of the field; therefore, no further rating is required.

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REFERENCES

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Appendix A

RESUMES OF TEAM MEMBERS

■ MICHAEL C. KEMP
Environmental Engineer

Education

M.S., Civil and Environmental Engineering, Utah State University, 1978
B.S., Civil Engineering (environmental emphasis), Tennessee Technological University, 1976

Experience

Since joining CH2M HILL in June of 1978, Mr. Kemp has participated in a variety of projects. His major project experience includes:

- On-site inspection, operations and maintenance manual preparation, and construction services for the expansion of a potato processing wastewater treatment plant in Quincy, Washington.
- Preparation of operating and closure plans for RCRA hazardous waste disposal requirements for Gulf Oil Company, Port Arthur, Texas.
- Preliminary study of sanitary landfill leachate treatment alternatives for Portland Metro.
- Feasibility of land application of pulp mill wastewaters for Australia Pulp Manufacturers, Melbourne
- Review of sampling, analysis, and treatability alternatives used in the EPA Aluminum Forming Development Document for the Aluminum Manufacturers Association.
- Miscellaneous coal fines dewatering facility design and hydraulic analyses for the Washington Irrigation and Development Company.
- *Miscellaneous facility design and preparation of the operations and* maintenance manual for the ITT Rayonier pulp mill wastewater treatment plant in Port Angeles, Washington.

Before joining CH2M HILL Mr. Kemp served 2 years as a laboratory research assistant at the Utah Water Research Laboratory where he conducted a wide variety of chemical and biological water quality analyses and operated a pilot scale overland flow tertiary treatment system. Mr. Kemp's other experience includes 6 months as a surveyor with the National Park Service and 1 year as an engineering assistant in a construction administration office of the Atomic Energy Commission.

Technical Certification

Engineer-In-Training, Tennessee
Class II Wastewater Treatment Plant Operator, Washington

MICHAEL C. KEMP

Membership in Organizations

American Society of Civil Engineers
Chi Epsilon
Pacific Northwest Water Pollution Control Association
Water Pollution Control Federation

Publications

Kemp, M.C., D.S. Filip, and D.B. George, 1978. Evaluation and Comparison of Overland Flow and Slow Rate Systems to Upgrade Secondary Wastewater Lagoon Effluent, Utah Water Research Laboratory, Logan, 70 pages.

Hansen, R.D., M.F. Torpy, M.C. Kemp, and D. Mills, 1980. Graduate Training in Water Track Environmental Engineering: Results of a Survey of Employers. Water Resources Bulletin, Vol. 16, No. 5, pp 862-865.

STEVEN R. HOFFMAN

Education

B.S., Civil Engineering, South Dakota School of Mines and Technology, 1971

Experience

Mr. Hoffman is a civil and sanitary engineer who is currently serving as a project manager and project technical consultant on a variety of solid and hazardous waste management projects for CH2M HILL. Examples of his project experience are:

- Project technical consultant on various aspects of municipal, industrial, and hazardous solid waste collection and disposal. Projects include collection system analysis; waste characterization and reduction; municipal solid waste landfill site selection, design, and gas recovery; and landfill disposal of hazardous and industrial sludges throughout the U.S.A.

- Project manager for a hazardous waste disposal study for an ARCO oil refinery in Washington, including waste extraction analysis, groundwater and unsaturate zone monitoring, and waste migration analysis.

- Project manager for assistance with compliance to RCRA regulations for a Gulf Oil refinery in Texas, including waste characterization, preparation of interim status plans, implementation of monitoring programs, and assistance in permit preparation.

- Assistant project manager for hazardous materials disposal site record searches for two U.S. Air Force bases to assess potential for waste migration from present and past practices and to recommend followup actions.

- Assistant project manager responsible for sanitary landfill design and preparation of operations plan and contract bid documents for a municipal solid waste landfill in Portland, Oregon.

- Project manager in developing a disposal system for and analyzing the impacts of a new land disposal technique for an industrial/hazardous sludge containing a high concentration of heavy metals, for the Monsanto Corporation, Seattle, Washington.

- Project manager for ITT Rayonier pulp and paper mill sludge disposal landfills in Grays Harbor and Clallam Counties, Washington, including site feasibility studies, final designs, and operational plans.

STEVEN R. HOFFMAN

- Assistant project manager for a resource recovery feasibility study and solid waste management plan for Snohomish County, Washington. The project includes alternative technology analysis, economic feasibility analysis, marketing studies, and management strategies.

- Project engineer for the Solid Waste Management Study for King County, Washington. Mr. Hoffman's responsibilities included assessing the environmental impacts of solid waste handling facilities and performing conceptual designs and costing for transfer stations, shredding and baling facilities, ocean disposal, resource recovery process systems, rail haul facilities, energy recovery systems, and sanitary landfills.

- Project manager for developing a solid waste management plan for Trinity County, California, with major emphasis on transfer, transport, sanitary landfill, and management options.

- Project manager and project engineer on a variety of water resources projects including flood studies, urban drainage and water quality studies, and environmental impact studies.

- Project engineer for developing a preliminary design for a solid waste transfer and refuse-derived fuel processing facility for the Metropolitan Service District, Portland, Oregon.

- Project engineer for preliminary and final design of a shredfill processing facility for Cowlitz County, Washington, which consisted of shredding, magnetic separation, leachate collection, treatment, and disposal.

- Project engineer for a pyrolysis and energy recovery feasibility study and a phased sanitary landfill design for Grays Harbor County, Washington. The design included a rural collection/transfer system to transport wastes to the landfill site.

Prior to joining CH2M HILL, Mr. Hoffman was a pollution control engineer with the Environmental Protection Agency where he conducted site investigations and wrote pollution control standards for South Dakota.

Professional Registration

Washington

Membership in Organizations

American Society of Civil Engineers

FRITZ R. CARLSON
Department Manager, Ground Water

Education

M.S., Hydrology, University of Arizona, 1974
Graduate Courses in Geology, University of California, Berkeley, 1966-68
B.A., Geology, University of California, Berkeley, 1966

Experience

Mr. Carlson is manager of the Ground Water Department for our Redding region with 9 years' experience in hydrogeology and ground-water hydrology. His capabilities include the following:

- Development of ground-water resources, including well and well field design, hydrogeologic mapping, aquifer testing, and well site selection

- Control of ground water, including design and analysis of subsurface drains and design of dewatering facilities

- Protection of ground-water resources, ranging from investigation of basinwide salt balance problems to site-specific investigations of ground-water pollution from landfills, tailings impoundments, radioactive liquids, and domestic wastewater

- Basin studies, including estimation of the recharge and discharge budget of ground-water basins—Such investigations include analysis of potential recharge and discharge under varying land use and pumping conditions.

- Modeling of ground-water flow and quality, ranging from simple analytical models of homogeneous flow fields to complex numerical models of the flow and quality of ground water in major ground-water basins

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Mr. Carlson's experience as a hydrogeologist includes the following projects:

- Water well and well field design for several areas throughout the U.S.

- Basinwide ground-water studies of the Round Valley and Livermore Valley, California, and Truckee Meadows, Nevada

- Analysis and mitigation of seasonally high ground-water levels in the Redding basin

- Analysis of pumping test permeability data for proposed damsites near Cottonwood, California

FRITZ R. CARLSON

- Preparation of a ground-water quality computer model of the Livermore Valley, California

- Analysis of the probable cause of decline in yield of key industrial wells in Pilot Rock, Oregon The study included analysis of present and future ground-water rights, regional declines in ground-water levels, and caving and incrustation of the existing well.

- Analysis of the ground-water regime in and near a proposed open-pit barite mine and tailings impoundment in Arkansas

- Hydrogeologic investigation of several alternative sites for a new sanitary landfill for Shasta County, California—The investigation included test drilling, permeability testing, and analysis of the rate and direction of leachate movement.

- Supervising hydrogeologist for a project to develop a large ground-water supply for a refinery and city in a remote area of Indonesia—This project included geologic mapping and rock source exploration, well design, well site selection, well field design, drilling supervision, aquifer testing, and water-quality testing.

- Study and prediction of the movement of radionuclides from hypothetical spills at numerous nuclear power plants

- Seepage estimates from various types of ponds at coal-fired plants, nuclear plants, and mines

Mr. Carlson has also been employed by Bechtel, Inc., as a hydrogeologist based in San Francisco, and by Lawrence and Associates in Redding, where he was vice-president and hydrogeologist. He also worked as a hydrogeologist while stationed in India with the U.S. Peace Corps.

Professional Registration

California – Registered Geologist No. 3397

Membership in Organizations

National Water Well Association

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JANE DYKZEUL GENDRON
Biologist

Education

B.A., Biology (emphasis on Marine Biology) San Francisco State University 1976

Experience

Ms. Gendron is a general biologist in the environmental sciences department of CH2M HILL. Her experience consists of studies in freshwater and marine biology and ecology, water quality sampling and analysis, and terrestrial ecology. She has participated in the assessment of the ecological impacts of many industrial and municipal developments.

Ms. Gendron's experience includes the following:

- Washington State Department of Ecology. Field data collection, laboratory water quality analysis, sanitary surveying, and report preparation for the bacteriological study of Willapa Bay.

- U.S. Air Force, West Coast bases. Assessed the potential for migration of hazardous material through natural systems at several west coast Air Force bases during Phase 1 of the Air Force Installation Restoration Program.

- Pacific Gas Transmission, San Francisco, California. Aquatic biology task leader in the selection of a natural gas pipeline corridor route in Wyoming, Utah, Nevada, and California.

- Metropolitan Service District, Portland, Oregon. Prepared preliminary site descriptions and identified sensitive species and systems occurring at or near several proposed sanitary landfill sites.

- Ventura Regional County Sanitation District, Oxnard, California. Field data collection, laboratory analysis, and report preparation for application for waiver of secondary sewage treatment requirements.

Before joining CH2M HILL, Ms. Gendron worked for the University of Southern California's Catalina Marine Science Center, where she designed and directed a reconnaissance survey of the terrestrial and marine ecosystems along 26 miles of coastland and was involved in an ecological assessment of impacts of the City of Avalon's marine sewage outfall.

Membership in Professional Organizations

American Fisheries Society
American Institute of Biological Sciences
Western Society of Naturalists

Publications (Authored as Jane E. Dykzeul)

"Reconnaissance Survey—Santa Catalina Island; Area of Special Biological Significance—Subarea 1." State of California Department of Fish and Game. Report to California State Water Quality Control Board. May 1978. 130 pp.

Appendix B

OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. U.S. Environmental Protection Agency, Oregon Operations
   Al Goodman (503)221-3250

2. Oregon State Department of Environmental Quality
   Klamath Falls, Gil Hargraves (503)883-5603
   Solid Waste Division, Joe Schultz (503)229-6237
   Hazardous Waste Division, Mike Ebling (503)229-6210
   Water Quality Division, Glenn Carter (503)229-6474
   Water Quality Division, Ed Quan (503)229-6978

3. Klamath County Planning Office
   Jonathan Chudnoff (503)882-2501
   Mark Beardsley (503)882-2501

4. Klamath County Department of Public Works
   Mr. Reed (503)882-2501

5. Klamath Falls Health and Safety Department
   (503)883-5358

6. City of Klamath Falls, Department of Public Works
   Tom Barnes, Superintendent of Utilities (503)883-5363

7. Oregon Technical Institute

   Dr. Wm. Johnson and Paul Lieneu (503)882-6321

8. U.S. Fish and Wildlife Service

   Endangered Species Office, David Marshall

   Klamath Basin National Wildlife Refuse, Robert Fields

   (916)667-2231

9. U.S. Bureau of Reclamation

   Lost River Diversion Project, Dan Fults, Jim Bryant, and Bill Wood (503)882-7761

10. U.S. Geological Survey, Menlo Park, California

    Ed Sammel (415)323-8211

11. U.S. Geological Survey, Portland, Oregon

    Joe Gonther and Stewart MacKenzie (503)231-2014

12. Oregon State Department of Fish and Wildlife

    Klamath District Biologist, John Fortune (503)883-5732

13. Oregon Natural Heritage Program

    Sam Johnson (503)228-9550

14. Oregon State Department of Water Resources, Salem

    Bill Bartholomew and Lauren Forcella (503)378-8455

Appendix C

INSTALLATION HISTORY

Appendix C

INSTALLATION HISTORY

KINGSLEY FIELD HISTORY

During World War II, the Navy constructed a Naval Air Station at the present site of Kingsley Field. Early in 1946, the station was deactivated and the facility was divided between the City of Klamath Falls and the Bureau of Reclamation, Department of the Interior. The City used the flying facility for a municipal airport and the Bureau of Reclamation used its portion for storage and administration for the extensive Klamath Irrigation District project. In 1954, the Air Force selected Klamath Falls as the site of a new all-weather fighter interceptor complex. The airfield and some facilities were leased from the City of Klamath Falls and other facilities were transferred from the Bureau of Reclamation. Construction of the first new facilities was started in 1955, and Kingsley Field was officially dedicated in 1957.

The first fighter unit assigned to Kingsley Field to meet the continuous fighter interceptor mission was the 322nd Fighter Interceptor Squadron (FIS) equipped with F-86 Sabre Jets. The original host was the 408th Fighter Group. In 1959 the 322nd FIS was replaced by the 59th FIS and Kingsley Field received its first supersonic aircraft, the F-101 Voodoo.

The 59th FIS remained at Kingsley with F-101 aircraft until 1969 when the 460th FIS, equipped with F-106 aircraft, was assigned to the field. The original host unit, the 408th Fighter Group, was deactivated in 1970 and renamed the 4788th Air Base Group. The 460th FIS was transferred to Grand Forks AFB in 1971 and Det 1, 84th FIS, was assigned to Kingsley

Field. The 4788th Air Base Group was deactivated in 1971 and the 827th Air Defense Group became the host unit at Kingsley Field, assuming responsibility for the missions performed at Kingsley Field and Keno Air Force Station. In 1974, Det 1, 84th FIS, was replaced by Det 1, 318FIS.

Since its dedication in 1957, Kingsley Field has been a joint use airfield with the City of Klamath Falls. The Air Force maintains the main instrument runway and associated taxiways and the City maintains the cross wind runways. The Air Force also provides primary fire crash and rescue and snow removal services by virtue of a letter of agreement.

KENO AFS HISTORY

Keno Air Force Station was constructed in 1957 and activated as a radar site for Air Force support of Kingsley Field in 1958. In 1962, the 827th Air Defense Group implemented "Project BUIC," which provided backup intercept control for the area. Construction of the Phase II BUIC Fallout Shelter was completed in 1965 and the Keno BUIC II station became operational in 1966. Construction of BUIC III facilities at Keno began in 1967, and became operational in 1969.

In 1971, Keno Air Force Station was assigned primary missions of long-range radar and BUIC III NORAD Control Center. Both functions were located at Keno Air Force Station. Changes made in 1974 reduced the mission at Keno to that of radar surveillance.

In 1977, the weather-radar station at Keno was reduced to an observation site. In 1977, the elaborate BUIC system at Keno Air Force Station was dismantled and shipped to Tyndall Air Force Base, Florida.

In 1978 the station was transferred to the Federal Aviation Administration (FAA). This action was part of the implementation of the Joint Surveillance System (JSS) concept. JSS is a network of radars whose data are shared by the North American Air Defense Command and the FAA as a more economical means of meeting both peacetime air defense and civilian air traffic control needs.

KINGSLEY FIELD PAST MISSION

Primary Mission

The mission of the 827th Air Defense Group was to equip, administer, and train personnel to operate and maintain, in a ready status, the Keno Air Force Station radar detection identification system. Keno AFS operated and maintained long-range radar equipment and provided search, height, and identification information of aircraft to the Air Defense SAGE direction center when the center was operative. Group personnel operated and maintained all military facilities at Keno AFS and Kingsley Field, Oregon, including all normal housekeeping support. Administrative and logistical support was provided to tenant units and to personnel manning the long-range radar sites at North Bend AFS, Oregon, and Klamath AFS, California. The 827th Air Defense Group was also responsible for providing logistic support to several classified contingency operations.

Tenant Mission

Det 1, 318 Fighter Interceptor Squadron: This detachment was responsible for maintaining a level of operational readiness to perform fighter interceptor defense of a portion of the northwest Continental United States. This included operating a combat alert center, performing organizational level maintenance on weapons systems and support equipment, and performing organizational and intermediate level maintenance on air defense weapons.

Operating Location "D" Det 4, 12 WWG: The primary mission of this unit was to provide weather observations and forecasts for the 827th Air Defense Group and its associated units.

104 Tactical Control Squadron (Control Reporting Post), Oregon Air National Guard: The Federal mission was to organize, equip, maintain, and train units for tactical weapons control by use of mobile radar and communications equipment required for target identification to tactical aircraft supporting ground operations. The State mission was to respond when required by competent orders of state authorities for protection of life and property, and for preservation of peace, order, and public safety.

Det 2, 1902 Communications Squadron (AFCS): This detachment was responsible for processing all incoming and outgoing message traffic; directing installation, removal and relocation of all telephones; and operation of the base switchboard.

Other: Space is provided for the Forest Service tankers in support of the forest fire retardant dropping aircraft.

General

Although the aircraft numbers and types have fluctuated since the inception of an Air Force mission at Kingsley, the basic mission has always been to support NORAD and the Aerospace Defense Command. Prior to 1971, the mission was developed around active fighter interceptor squadrons to provide air defense of the Pacific Northwest. Additionally, there was a Back-up Interceptor Control Center at Keno to supplement NORAD Region Headquarters at McChord AFB, Washington.

Reference: TAB A-1, Environmental Narrative, Kingsley Field, Oregon.

KINGSLEY FIELD CURRENT MISSION

Primary Mission

The mission of the Operating Location CC/25-Air Defense, formed on January 1, 1982, is to support the Oregon Air National Guard's Operation Location Alert Detachment of the 142nd Fighter Interceptor Group. The Operating Location CC provides the overall management of Kingsley Field, including administration, safety, budget, supply, fuels, transportation and civil engineering. The Operating Location CC is supported by TAC Headquarters, reporting directly to the 25th Air Division Commanding Officer.

Tenant Mission

Operation Location Alert Detachment, 142nd Fighter Interceptor Group: This operating location is responsible for maintaining a level of operational readiness to perform fighter interceptor defense of a portion of the Northwest continental United States. This includes operating a combat alert center, security of operational mission resources, and intermediate-level maintenance on air defense weapons and support equipment.

KLAMATH AFS HISTORY

Klamath AFS was activated in 1951 as the host of the 777th Radar Squadron a unit of the 28th Air Division, Western Air Defense Force, Hamilton AFB, California. In a reorganization within the Air Defense Command, the squadron was redesignated the 777th Radar Squadron in 1959 and became a part of the Semi-Automatic Ground Environment (SAGE) system under the

25th Air Division, McChord Air Force Base, Washington. In 1960, the squadron was made part of the Portland Air Defense Sector, one of two sectors within the 25th Air Division.

During the summer of 1960, radar maintenance, operations, communications, and maintenance coordination centers assumed their roles within the primary mission of the squadron. By the spring of 1961, the Data Monitoring and Control Center was completed and in operation. Adding to the operational capability of Klamath AFS was the AN/FPS-26 tower completed during 1962 and the AN/FPS-27 tower completed in late 1963.

In 1966 the Portland Air Defense sector was redesignated as the 26th Air Division under 4th Air Force Headquarters located at Hamilton AFB, California. With the closure of the 26th Air Divison and 4th Air Force Headquarters (AFH) in 1969, Klamath AFS became part of the 10th Air Force located at Richards-Gebaur AFB, Missouri. When the numbered Air Forces were phased out in 1970, the 777th Radar Squadron was again made part of the 25th Air Division at McChord AFB, Washington, and has remained in that status to the present time.

Reference: U.S. Air Force, 1973. Installation Survey Report, Executive Order 11508.

Appendix D

INDUSTRIAL FACILITIES

Table D-1
INDUSTRIAL FACILITIES AND OPERATIONS AT KINGSLEY FIELD, KENO AFS, AND KLAMATH AFS

Facility	Present Location (Bldg. No./ Initial Date)	Past Location (Bldg. No./ Initial Date)	Potential Waste Material
Kingsley Field[a]			
POL Area	--	--	JP-4, diesel, MOGAS
Aircraft Refueling	--	--	JP-4
Aircraft Wash Rack	--	--	Oils, greases, detergents
Refueling Vehicle Shop	238/1960	--	POL, soap
Entomology	227/1962	--	Pesticides, herbicides
Auto Hobby Shop	224/1980	239/1966 to 1980	POL, solvents, paints
BX Service Station	120/1962	--	POL
Dispensary	123/1958	--	Medical, chemical
ANG Motor Pool and Generators	213/1959	--	POL
Hangar	219/1955	--	POL, soap
Paint and Carpenter Shop	220/1943	--	Paint, solvents, glue
Heating Plant	300/1955	--	Coal fines, ash, chemicals
CE Maintenance Shop	238/ --	573/1956	POL, anti-freeze, solvents
DPDO	571/1964	--	All types
Vehicle Wash Rack	572/1966	--	POL, solvents, detergents
AGE Maintenance	239/1980	219/prior to 1980	POL, solvents, fuels
Engine Test Cell	600/1956	--	Fuels, POL
Fuels Testing and Battery Shop	228/ --	--	Fuels, acids
Keno AFS[b]			
Power Plant	24/1958	--	POL, solvents, cooling water
STP Percolation Pond	--/1971	--	Sanitary/industrial wastewater
Maintenance Shop	20/1958	--	POL, fuels, solvents
Klamath AFS[c]			
Power Plant	124/1951	--	POL, fuels
Heating Plant	214/1951	--	Fuel oil
Motor Vehicle Maintenance	218/1951	--	Solvents, POL, fuel
Special Services Shop	110/1951	--	Solvents, POL, fuel
Auto Hobby Shop	109/1951	--	Solvents, POL, fuel

[a] Prior to 1979 all solid wastes were buried in Kingsley Field landfills. Since 1979, the solid wastes have been hauled off site. Liquid wastes have been discharged to the sanitary sewer, burned in fire training, or salvaged.

[b] On-site disposal of solid wastes; liquid wastes salvaged or discharged to sanitary sewer.

[c] Off-site disposal of solid wastes; liquid wastes salvaged or discharged to sanitary sewer.

Appendix E

POL STORAGE TANKS

Table E-1
POL STORAGE TANKS AT KINGSLEY FIELD
AND KLAMATH AFS

Facility	Tank No.	Liquid	Capacity-Each (gal)	Location
Kingsley Field				
3150	3	JP-4	200,000	POL Farm
3153	4	JP-4	600,000	POL Farm
3101	5	MOGAS	25,000	POL Farm
3170	6	Diesel	25,000	POL Farm
3100	8	JP-4 Recovery/ MOGAS	25,000	POL Farm
3172	-	Waste Oil Recovery/ MOGAS	6,000	Motor Pool
3172	-	Waste Oil Recovery/ MOGAS	8,000	Motor Pool
-	-	Fuel Oil	240	Bldg. 240
-	-	Fuel Oil	640	Bldg. 303
3290	-	Fuel Oil	10,000	Bldg. 400
3291	-	Fuel Oil	2/1,000	Bldg. 500
3134	-	Fuel Oil	400	Bldg. 535
3133	-	Fuel Oil	4,960	Bldg. 536
-	-	Fuel Oil	640	Bldg. 571
-	-	Fuel Oil	4,000	Bldg. 573
3292	-	Fuel Oil	675	Bldg. 575
210	-	Diesel	250	Bldg. 210
214	-	Diesel	1,500	Bldg. 214
402	-	Gas	500	Bldg. 402
550	-	Diesel	400	Bldg. 550
570	-	Gas	250	Bldg. 570
3135	-	Diesel	600	Bldg. 235
3130	-	Diesel	1,000	Bldg. 226
3130	-	Diesel	1,300	Bldg. 226
	-	MOGAS	600	Bldg. 120
3173				
	-	MOGAS	2/4,000	Bldg. 120
3173				
	-	MOGAS	6,000	Bldg. 120
-	-	Waste POL	6,000/ 8,000	Bldg. 238
-	-	Waste POL	-	Bldg. 120
-	-	Waste POL	500	Bldg. 573
-	-	Waste POL	500	Bldg. 575
Klamath AFS				
1000	-	Diesel	2/67,500	Bldg. 120
1000	-	Diesel	45,000	Bldg. 120
1000	-	Waste Oil	10,150	Bldg. 120
1000	-	Lube Oil	1,000	Bldg. 120
1011	-	Diesel	9,400	Bldg. 214
1001	-	MOGAS	1,500	Vehicle Fueling

Note: Keno AFS tanks not identified.

Appendix F

ABANDONED TANKS

Table F-1
ABANDONED TANKS AT KINGSLEY FIELD

Facility	Tank Number	Liquid	Capacity	Location
3152	1	JP-4	100,000	POL Farm
3151	2	JP-4	100,000	POL Farm
-	7	-	-	POL Farm

Notes: Tanks 1 and 2 are "pickled" with caustic solution and 7 is filled with sand.
Tank status at Keno AFS and Klamath AFS is unknown.

Appendix G

OIL/WATER SEPARATORS

Table G-1
OIL/WATER SEPARATORS AT KINGSLEY FIELD

Facility	Description	Year Installed
238	Refueling Vehicle Shop	1965 estimate
239	Auto Hobby Shop	1965 estimate
-	Aircraft Wash Rack	1965

Appendix H

SITE HAZARD RATING METHODOLOGY

HQ AIR FORCE ENGINEERING AND SERVICES CENTER
AND
USAF OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY

SITE RATING METHODOLOGY

FOR

PHASE I
INSTALLATION RESTORATION PROGRAM

July 1981

SITE RATING METHODOLOGY

FOR

PHASE I INSTALLATION RESTORATION PROGRAM

1. This site rating methodology for Phase I of the Installation Restoration Program (IRP) has been jointly developed by CH_2M Hill and Engineering-Science based on experience in performing Record Searches at several Air Force installations. This standard site rating system should be used for all Air Force IRP Records Search efforts to assist in Air Force prioritization and commitment of resources for Phase II survey actions.

2. The basis for the rating system is the document developed by JRB Associates, Inc. for the EPA Hazardous Waste Enforcement office. The JRB system was modified to accurately address specific Air Force installation conditions and to provide meaningful comparison of landfills and contaminated areas other than landfills.

3. Questions pertaining to use of the Air Force Site Rating Methodology should be addressed to either Mr. Lindenberg, AFESC/DEVP, AUTOVON 970-6189 (Commercial (904) 283-6189) or Major Fishburn, AF OEHL/EC, AUTOVON 240-3305 (Commercial (512) 536-3305).

Note: Both CH_2M Hill and Engineering-Science are Engineering Support contractors for the US Air Force.

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site ____________________

Location ____________________

Owner/Operator ____________________

Comments ____________________

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet		4		
Distance to Nearest Drinking Water Well		15		
Distance to Reservation Boundary		6		
Land Use/Zoning		3		
Critical Environments		12		
Water Quality of Nearby Surface Water Body		6		

Number of Assumed Values = _____ Out of 6

Percentage of Assumed Values = _____ %

Number of Missing Values = ____ Out of 6

Percentage of Missing Values = ____ %

SUBTOTALS ________ ______

SUBSCORE ______

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination		10		
Level of Water Contamination		15		
Type of Contamination, Soil/Biota		5		
Distance to Nearest Surface Water		4		
Depth to Groundwater		7		
Net Precipitation		6		
Soil Permeability		6		
Bedrock Permeability		4		
Depth to Bedrock		4		
Surface Erosion		4		

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____ %

SUBTOTALS ________ ______

SUBSCORE ______

(Factor Score Divid[illegible] by Maximum Score and Mul[illegible]ied [illegible] 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE ______

Reason for Assigned Hazardous Rating:

______

______

______

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		7		
Hazardous Waste Quantity		7		
Total Waste Quantity		4		
Waste Incompatibility		3		
Absence of Liners or Confining Beds		6		
Use of Leachate Collection System		6		
Use of Gas Collection Systems		2		
Site Closure		8		
Subsurface Flows		7		

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = ____ Out of 9

Percentage of Missing and Non-Applicalbe Values = ____%

SUBTOTALS ______ ______

SUBSCORE ______

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE ______

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

RATING FACTOR SYSTEM GUIDELINES

RECEPTORS

Rating Factors	Rating Scale Levels: 0	1	2	3
Population within 1,000 Feet	0	1 to 25	26 to 100	Greater than 100
Distance to Nearest Drinking Water Well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet
Distance to Reservation Boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet
Land Use/Zoning	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential
Critical Environments	Not a critical environment	Pristine natural areas	Wetlands; flood plains, and preserved areas; presence of economically important natural resources	Major habitat of an endangered or threatened species; presence of recharge area
Water Quality Designation of Nearest Surface-Water Body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies
	PATHWAYS			
Evidence of Water Contamination	No contamination	Indirect evidence	Positive proof from direct observation	Positive proof from laboratory analyses
Level of Water Contamination	No contamination	Low levels, trace levels, or levels less than maximum contaminant level (MCL) or EPA drinking water standards	Moderate levels or levels near MCL or EPA drinking water standards	High levels greater than MCL or EPA drinking water standards
Type of Contamination Soil/Biota	No contamination	Suspected contamination	Moderate contamination	Severe contamination
Distance to Nearest Surface Water	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet
Depth to Ground Water	Greater than 500 feet	51 to 500 feet	11 to 50 feet	0 to 10 feet
Net Precipitation	Less than −10 inches	·10 to +5 inches	+5 to +20 inches	Greater than +20 inches
Soil Permeability	Greater than 50% clay ($<10^{-6}$ cm/s)	30% to 50% clay (10^{-4} to 10^{-6} cm/s)	15% to 30% clay (10^{-2} to 10^{-4} cm/s)	0% to 15% clay ($>10^{-2}$ cm/s)
Bedrock Permeability	Impermeable ($<10^{-6}$ cm/s)	Relatively impermeable (10^{-4} to 10^{-6} cm/s)	Relatively impermeable (10^{-2} to 10^{-4} cm/s)	Very permeable ($>10^{-2}$ cm/s)
Depth to Bedrock	Greater than 60 feet	31 to 60 feet	11 to 30 feet	0 to 10 feet
Surface Erosion	None	Slight	Moderate	Severe

WASTE CHARACTERISTICS

Judgemental hazardous rating from 30 to 100 points based on the following guidelines:

Points	Condition
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

WASTE MANAGEMENT PRACTICES

	Rating Scale Levels			
Rating Factors	0	1	2	3
Record Accuracy and Ease of Access to Site	Accurate records, no unauthorized dumping	Accurate records, no barriers	Incomplete records, no barriers	No records, no barriers
Hazardous Waste Quantity	<1 ton	1 to 5 tons	5 to 20 tons	>20 tons
Total Waste Quantity	0 to 10 acre feet	11 to 100 acre feet	101 to 250 acre feet	Greater than 250 acre feet
Waste Incompatibility	No incompatible wastes are present	Present, but does not pose a hazard	Present and may pose a future hazard	Present and posing an immediate hazard
Absence of Liners or Confining Strata	Liner and confining strata	Liner or confining strata	Low quality liner or low permeability strata	No liner, no confining strata
Use of Leachate Collection Systems	Adequate collection and treatment	Inadequate collection or treatment	Inadequate collection and treatment	No collection or treatment
Use of Gas Collection Systems	Adequate collection and treatment	Collection and controlled flaring	Venting or inadequate treatment	No collection or treatment
Site Closure	Impermeable cover	Low permeability cover	Permeable cover	Abandoned site, no cover
Subsurface Flows	Bottom of landfill greater than 5 feet above high ground-water level	Bottom of landfill occasionally submerged	Bottom of fill frequently submerged	Bottom of fill located below mean ground-water level

Appendix I

SITE ASSESSMENT AND RATING FORMS

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 2 Base Landfill
Location Kingsley Field
Owner/Operator Kingsley Field
Comments
industrial / domestic fill

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	55	138
		SUBSCORE		40

Number of Assumed Values = ____ Out of 6
Percentage of Assumed Values = ____%
Number of Missing Values = __ Out of 6
Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	0	4	0	12
		SUBTOTALS	51	195
		SUBSCORE		26

Number of Assumed Values = ____ Out of 10
Percentage of Assumed Values = ____%
Number of Missing Values = ____ Out of 10
Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
short term fill - very low quantities

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	1	7	7	21
Hazardous Waste Quantity	1	7	7	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility Assume	1	3	3	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	3	7	21	21

Number of Assumed Values = 1 Out of 9 SUBTOTALS 100 150

Percentage of Assumed Values = 11 % SUBSCORE 67

Number of Missing and Non-Applicable Values = ___ Out of 9 (Factor Score Divided by Maximum Score and Multiplied by 100)

Percentage of Missing and Non-Applicalbe Values = ___ %

Overall Number of Assumed Values = 1 Out of 25

Overall Percentage of Assumed Values = 4 %

OVERALL SCORE 45

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 3 - Base Landfill

Location Kingsley Field

Owner/Operator Kingsley Field

Comments

industrial domestic fill

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	73	138
		SUBSCORE		53

Number of Assumed Values = ____ Out of 6

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 6

Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	3	5	15	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	2	4	8	12
		SUBTOTALS	99	195
		SUBSCORE		51

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 90

Reason for Assigned Hazardous Rating:
long term base landfill
1 cubic yard DDT reported

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	1	7	7	21
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	2	4	8	12
Waste Incompatibility Assume	1	3	3	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	3	7	21	21

Number of Assumed Values = 1 out of 9
Percentage of Assumed Values = 11 %
Number of Missing and Non-Applicable Values = ____ out of 9
Percentage of Missing and Non-Applicalbe Values = ____ %

SUBTOTALS 111 150
SUBSCORE 74
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 out of 25
Overall Percentage of Assumed Values = 4 %

OVERALL SCORE 66
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 8 East Fire Training

Location Kingsley Field

Owner/Operator Kingsley Field

Comments

waste POL, fuel burning

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	55	138
		SUBSCORE		40

Number of Assumed Values = ____ Out of 6

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 6

Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:
Known POL & solvent burning

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility Assume	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	NA	6	–	–
Use of Gas Collection Systems	NA	2	–	–
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = 1 out of 9

Percentage of Assumed Values = 11 %

Number of Missing and Non-Applicable Values = 2 out of 9

Percentage of Missing and Non-Applicalbe Values = 22 %

SUBTOTALS 76 126

SUBSCORE 60

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 out of 25

Overall Percentage of Assumed Values = 4 %

OVERALL SCORE 46

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 11 Diesel Spill
Location Kingsley Field
Owner/Operator Kingsley Field
Comments
10,000 oil spill

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	55	138
		SUBSCORE		40

Number of Assumed Values = ____ Out of 6
Percentage of Assumed Values = ____ %
Number of Missing Values = ____ Out of 6
Percentage of Missing Values = ____ %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	0	4	0	12
		SUBTOTALS	51	195
		SUBSCORE		26

Number of Assumed Values = ____ Out of 10
Percentage of Assumed Values = ____ %
Number of Missing Values = ____ Out of 10
Percentage of Missing Values = ____ %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
Not verified by observation

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	1	7	7	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	N.A. -	6	-	-
Use of Gas Collection Systems	N.A. -	2	-	-
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 76 126

SUBSCORE 60

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ___ Out of 25

Overall Percentage of Assumed Values = ___%

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

Appendix J
REGIONAL FLORA AND FAUNA

Table J-1
REPRESENTATIVE FLORA OF
KINGSLEY FIELD AND VICINITY

Common Name	Scientific Name	Grassland	Forest	Wetland
Kingsley Field				
Nevada bluegrass	*Poa scabrella*	x		
Idaho fescue	*Festuca idahoensis*	x		
Sheep fescue	*Festuca ovina*	x		
Salt grass	*Distichlis* spp	x		
June grass	*Koeleria cristata*	x		
Downy chess	*Bromus tectorum*	x		
Wheatgrass	*Agropyron* spp	x		
Sagebrush	*Artemisia tridentata*	x		
Greasewood	*Sarcobatus vermiculatus*	x		
Rabbitbrush	*Chrysothamnus nauseosus*	x		
Bitterbrush	*Purshia tridentata*	x		
Russian thistle	*Salsola kali*	x		
Cattail	*Typha* spp			x
Bulrush	*Scirpus* spp			x
Burreeds	*Sparganiam* spp			x
Keno AFS				
Ponderosa pine	*Pinus ponderosa*		x	
Lodge pole pine	*Pinus contorta*		x	
White fir	*Abies concolor*		x	
Douglas fir	*Pseudotsuga taxifolia*		x	
Manzanita	*Arctostaphylos patula*		x	
Snowbrush	*Cleanothus velutinus*		x	
Mountain mahogany	*Cercocarpus* spp		x	
Mullein	*Verbascum thapsus*	x	x	

Table J-2
REPRESENTATIVE FAUNA OF
KINGSLEY FIELD AND VICINITY

Common Name	Scientific Name	Grassland	Forest	Wetland
Mammal				
Pocket gopher	*Thomomys talpoides*	x	x	
Muskrat	*Ondatra zibethica*			x
Skunk	*Mephitis* spp.	x	x	x
Weasel	*Mustela erminea*		x	
Cottontail	*Sylvilagus nuttalli*	x	x	
Blacktail jackrabbit	*Lepus californicus*	x		
River otter	*Lutra canadensis*			x
Red fox	*Vulpes fulva*	x	x	
Coyote	*Canis latrans*	x	x	
Deer mouse	*Peromyscus maniculatus*	x	x	
Western jumping mouse	*Lapus princeps*	x		x
Shrew	*Sorex* spp.	x	x	x
Ground squirrel	*Spermophilus* spp.	x	x	x
Mule deer	*Odocoileus nemionus*	x	x	
Reptiles and Amphibians				
Gopher snake	*Pituophis melanoleucus*	x	x	
Long-toed salamander	Ambystoma macrodactyleum			x
Great basin spadefoot	*Scaphiopus intermontanus*	x	x	
Boreal toad	*Bufo boreas*	x	x	x
Pacific treefrog	*Hyla regilla*			x
Western fence lizard	*Sceloporus occidentalis*	x	x	x
Birds				
Egrets	*Casmerodius albus*			
White pelican	*Pelecanus erythrorhynchos*			
Cormorant	*Phalacrocorax auritus*			
Mergansers	*Mergus* spp.			
Gulls	Larinae			
Terns	Sterninae			
Ducks & geese	Anatidae Anserinae			
Ring-necked pheasant	*Phasianus colchicus*			
California quail	*Lophortyx californicus*			
Mourning dove	*Zenaida macroura*			
Rufous-sided towhee	*Pipilo erythrophalmus*			
House sparrow	*Passer domesticus*			
Red-winged blackbird	*Angelaius phoeniceus*			
Long-billed marsh wren	*Cistothorus palustris*			
Barn owl	*Tyto alba*			
Turney vulture	*Cathartes aura*			

Appendix K

HERBICIDE AND OTHER PESTICIDE USAGE

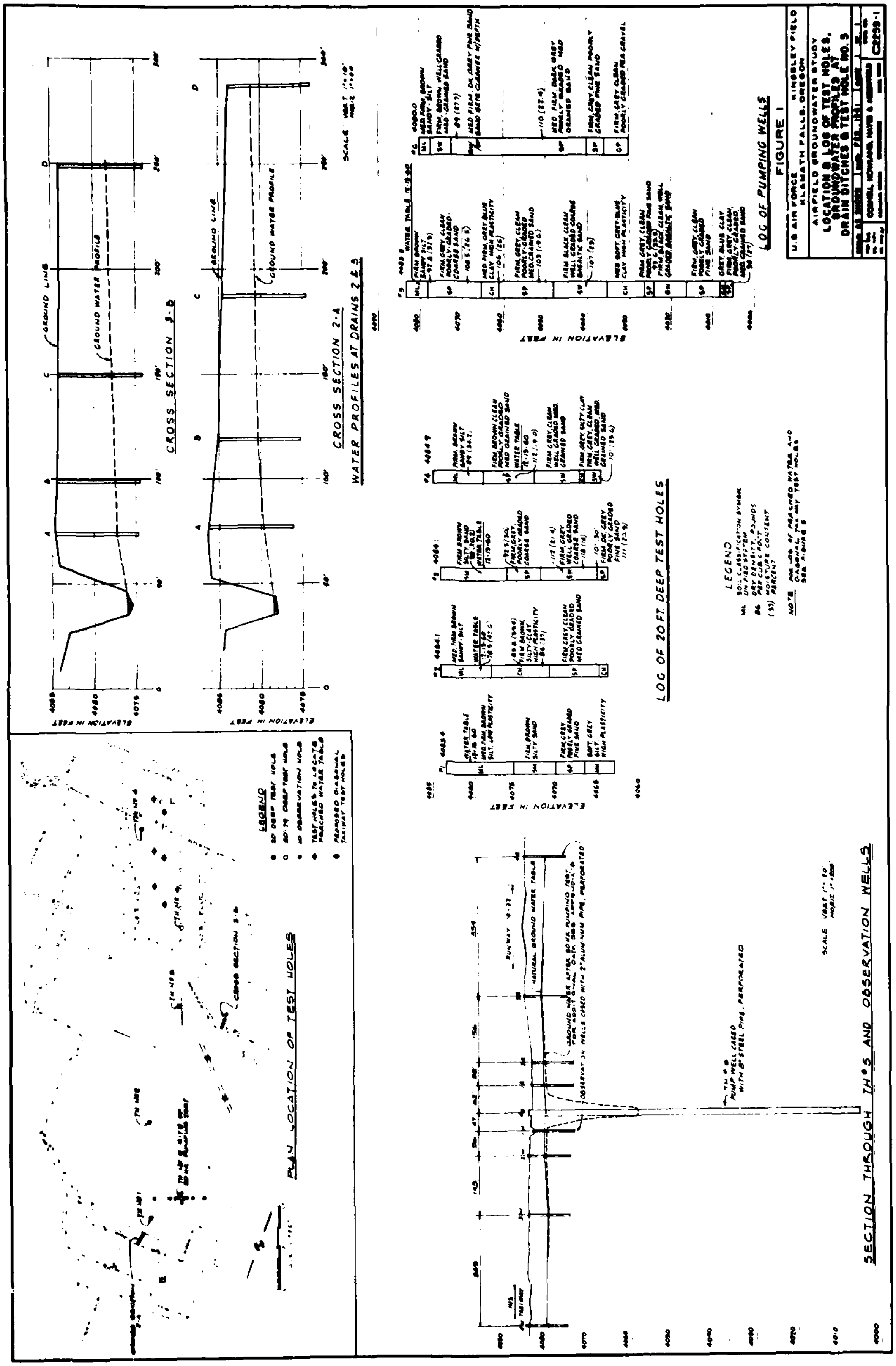
Table K-1

HERVICIDE AND OTHER PESTICIDE USAGE ON KINGSLEY FIELD

Chemical	Usage
Current	
2,4-D	Herbicide; weed control, various areas
Monuron	Soil sterilant; fire training areas, fence line
Insecticides	Follow recommendations in Oregon Insect Control Handbook
Past	
DDT	Insecticide used in various areas, used until early 1960's

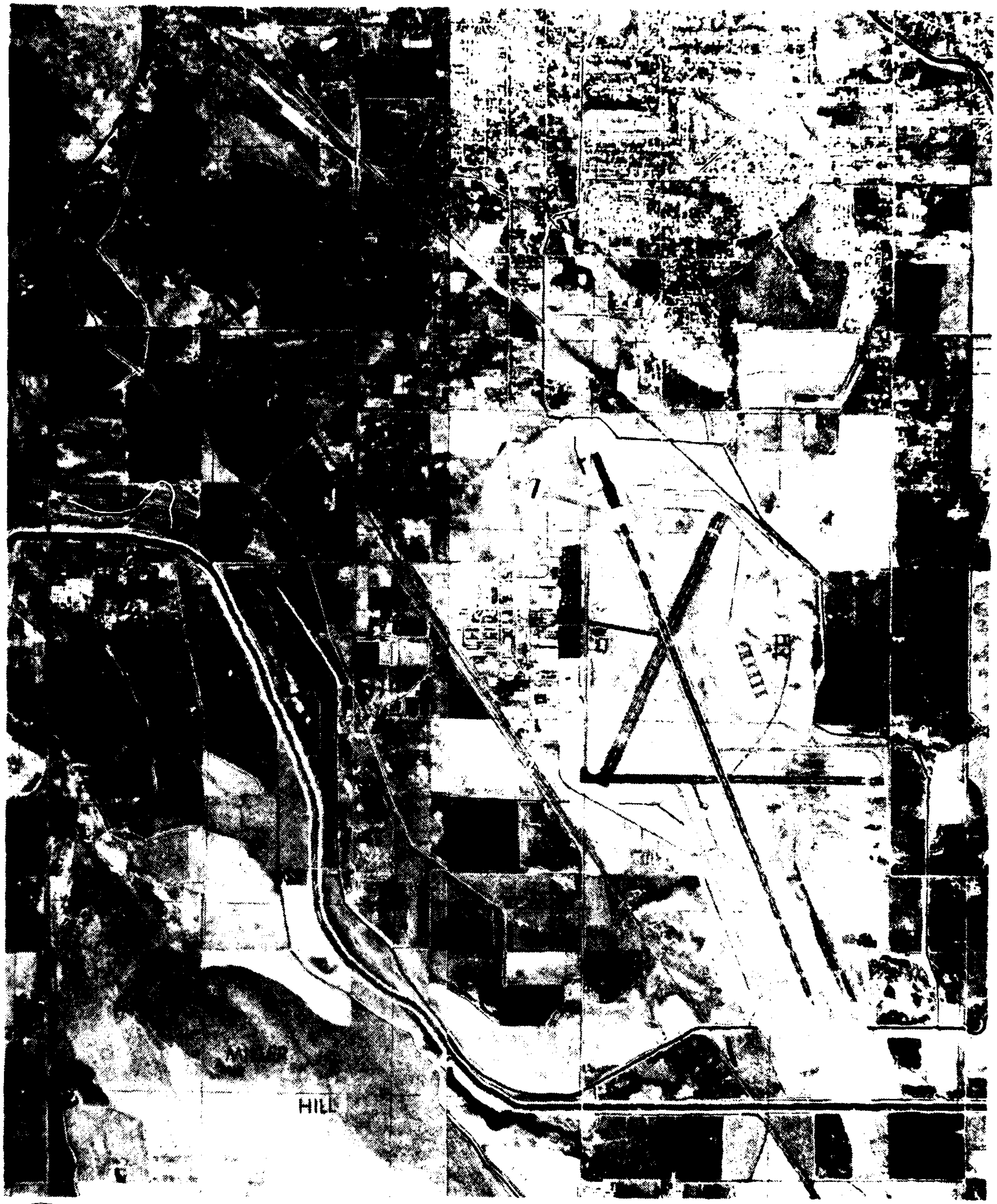
Appendix L

WELL LOGS AT KINGSLEY FIELD



CROSS SECTION 3-D
CROSS SECTION 2-A
WATER PROFILES AT DRAINS 2 & 5
GROUND LINE
GROUND WATER PROFILE
LOG OF 20 FT. DEEP TEST HOLES
LOG OF PUMPING WELLS
FIGURE 1
PLAN LOCATION OF TEST HOLES
SECTION THROUGH TH'S AND OBSERVATION WELLS
U.S. AIR FORCE
KINGSLEY FIELD
KLAMATH FALLS, OREGON
AIRFIELD GROUNDWATER STUDY
LOCATION & LOG OF TEST HOLES, GROUNDWATER PROFILES AT DRAIN DITCHES & TEST HOLE NO. 3

Figure L–1



0 ½ 1

MILES

NOTE: Locations are not known for all the logs.

NUMBERS REFER TO LOG NUMBERS IN THIS REPORT; NUMBERS ARE SHOWN IN UPPER RIGHT HAND CORNER OF THE LOG.

Figure L-2
LOCATION OF WELL LOG DATA

U.S.G.S. Test Well

WRD Rep. (GW)
April 1966

Well No. ____

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by: NV — Source of data: obsv. + log — Date: 7-29-74 — Map: Merrill 1:62500

State: Oregon — County (or town): Klamath

Latitude: ____ — Longitude: ____ — Sequential number: ____

Lat-long accuracy: ____ T. 39 S. R. 9 E. Sec 22 dec ____ B & M

Local well number: ____ — Other number: ____

Local use: ____ — Owner or name: U.S. Air Force

Owner or name: ____ — Address: Kingsley Field ORE.

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — U.S.G.S.

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (Y) Desal-P S, (Z) Desal-other, (O) Other — Test Well

Use of well: (A) Anode, (B) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (D) Destroyed.

DATA AVAILABLE: Well data ____ Freq. W/L meas.: ____ Field aquifer char. ____

Hyd. lab. data: ____

Qual. water data, type: ____

Freq. sampling: ____ Pumpage inventory: yes no, period: ____

Aperture cards: ____ yes

Log data: drill log by U.S.G.S.

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD — Depth well: 463 ft — Meas. rept.

Depth cased (first perf.): 0 ft — Casing type: 0 — Diam. 4 3/4 in — accuracy

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., screen, (S) sd. pt., (T) shored, (W) open hole, (X) other

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (X) other

Date Drilled: 5-24-74 — Pump intake setting: ____ ft

Driller: Robert Pemberton, U.S.G.S. Denver Colorado. (name, address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (O) other — Deep / Shallow

Power (type): diesel, elec, gas, gasoline, hand, gas, wind; H.P. ____ LP nat — Trans. of meter no. ____

Descrip. MP: ground surface — 0 ft above below LSD, Alt. MP ____

Alt. LSD: 4080 — Accuracy (source): ____

Water level: 8 ft above below MP; ft above below LSD — Accuracy: meas

Date meas: 5-24-74 — Yield: — gpm — Method determined ____

Drawdown: — ft — Accuracy: — — Pumping period: — hrs

QUALITY OF WATER DATA: Iron ____ ppm Sulfate ____ ppm Chloride ____ ppm Hard. ____ ppm

Sp. Conduct ____ K x 10⁶ — Temp. cold °F — Date sampled ____

Taste, color, etc. ____

Well No. ____

Latitude-longitude ____

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD — Physiographic Province: ____ Section: ____

Drainage basin: ____ Subbasin: ____

Type of well site: (D) depression, (C) stream channel, (D) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat

MAJOR AQUIFER: ____ system, ____ series, ____ aquifer, formation, group

Lithology: lake seds. — Origin: ____ — Aquifer Thickness: ____ ft

Length of well open to: ____ ft — Depth to top of: ____ ft

MINOR AQUIFER: ____ system, ____ series, ____ aquifer, formation, group

Lithology: lake seds. — Origin: ____ — Aquifer Thickness: ____ ft

Length of well open to: ____ ft — Depth to top of: ____ ft

Intervals Screened: ____

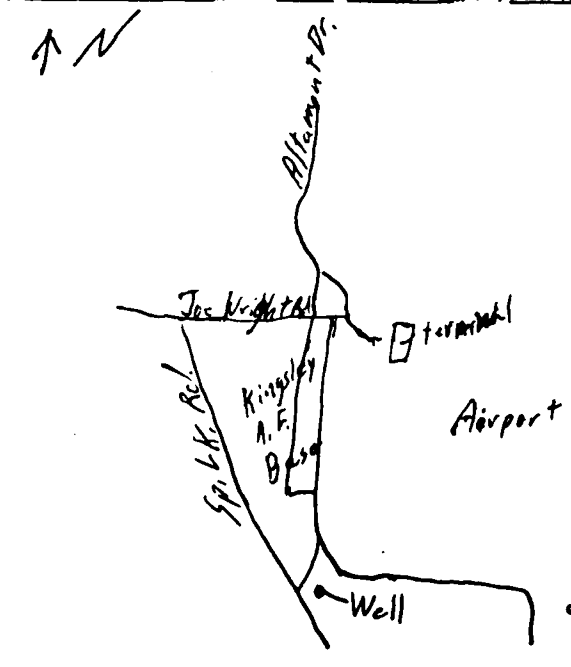
Depth to consolidated rock: none ft — Source of data: obsv

Depth to basement: ____ ft — Source of data: ____

Surficial material: ____ — Infiltration characteristics: ____

Coefficient Trans: ____ gpd/ft — Coefficient Storage: ____

Coefficient Perm: ____ gpd/ft²; Spec cap: ____ gpm/ft; Number of geologic cards: ____



Well No. ____

GPO 830-863

Drill log Well ~~#~~ 39/9-22 dcc

U.S.G.S. Test well, located at Kingsley Field Air Force Base, Klamath Co., Oregon.
Driller Robert Pemberton
Started 5-22-74 ~~[illegible]~~ Finished 5-24-74

Depth in Feet		Material
0	14	clay: with some silt: wet, brown, plastic.
14	16	Sand: coarse, sub-rounded, with fine, black grain
16	35	clay: grey, stickey. Contains ~~very fine~~ sand: very fine, red and black, some medium grained, basalt. Minor amounts of greenish clay and plant material.
35	37	clay: tan, sticky; with sand, fine, black and tan, some plagioclase grains.
37	45	clays: mixed grey and tan, some sand.
45	55	sand: medium grained, rounded, predominantly black, some red and tan. Much organic material.
55	65	clay: grey, sticky, comes to surface in large pieces. Some sand: fine grained, black. Much organic material.
65	89	clay: silty, darker grey than that ~~in~~ immediately above. Silt size particles: black and red.
89	92	sand: medium grained, sub-angular to well rounded. Mostly black, but some tan and white grains which are probably plagioclase.

Drill log Well # 39/9-22 dcc

Depth in Feet		Material
92	105	interbedded clay and sand. Clay: dark grey. Sand: medium-grained, well rounded. Black grains predominant with some white, probably plagioclase.
105	108	sand: medium-grained, well rounded, dark.
108	135	clay: ~~clay~~ dry, hard, green. Some softer beds with sand. Some brownish clay.
135	150	sand: medium grained, well rounded, black predominant with some red cinders. A little clay: grey-green.
150	160	Same as immediately above with increased amount of clay.
160	164	clay: grey, very hard.
164	177	clay: green, soft, some sand.
177	184	sand: well rounded, dark. Some silty clay.
184	186	clay: grey, silty, hard. silt: black.
186	189	silt: tan, soft. Some fine sand, composed of quartz or plagioclase.
189	195	silt: grey, soft, with black sand.
195	197	silt: grey, hard, some green clay.
197	203	sand: sand, medium grained, rounded, black. siltyclay matrix.
203	215	silt: dark grey, with thin beds of clay: green, slick; and thin beds of sand: fine to medium grained, sub angular.

Drill log Well # 39/9-22 dcc

Depth in feet		Material
215	235	sand: medium-grained, well rounded, approximately 5% coarse-grained predominantly black (basaltic) with some plagioclase and brown lithic fragments, and red cinders.
235	236	silt: black, with very fine black sand.
236	267	sand: fine-grained, black, with tan and grey silt. 250-258, lightly cemented.
267	314	silt: greenish-grey, soft with fine black sand. Occasional thin beds of tan silt and lightly cemented sand.
314	330	silt: tan. Fine particles with some larger, black fragments containing clay.
330	355	silt: tan, but with increased amounts of grey-green silt and fine to medium grained sand.
355	360	silt: greenish-grey, dry. Contains very small black grains.
360	367	silt: green with very fine black sand silt: tan silt: green, no sand.
367	377	silt: tan, with black, angular basalt fragments up to ½ cm in diameter. Some green silt with and without fine, black sand.
377	390	sandstone: brown, fine grained, with medium grained black grains and plagioclase. Scoria, black, up to 1 cm in diameter

Drill log Well # 39/9-22 dcc

Depth in	Feet	Material
390	395	clay and silt: very fine, green.
395	463	silt: black, very sticky. Fine black grains in grey-black matrix. 412-417 some tan sandstone 425 Some fine, black sand 435 increased amounts of very fine black sand.

As drill stem removed, head rose to 25 feet above land surface, ~~[illegible] of stem~~ when bit was at 230 feet. Well allowed to stand overnight. Head in morning standing 8 feet below land surface. After 20 feet of stem removed, head rose again to 15 feet above land surface. We assumed that a gas pocket had been encountered.

The hole was filled with cement and drilling mud, and abandoned.

To depth of 150 ft?

Total depth 463 ft.
diameter 4¾ in.
Water Level 8 ft 5-24-74

WRD Rep. (GW)
April 1966

Well No. ______

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by: NV — Source of data: obsv — Date: 12-26-73 — Map: Merrill 1:62500

State: Ore — County (or town): Klamath

Latitude: ______ Longitude: ______ Sequential number: ______

Lat-long accuracy: ______ T. 39 S. R. 9 E. Sec. 25 abd

Local well number: ______ Other number: ______

Local use: ______ Owner or name: Don Jungali

Owner or name: ______ Address: RT 1 Box 552 D

Ownership: (C) County, (F) Fed Gov't, (N) City, (W) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed

DATA AVAILABLE: Well data ______ Freq. W/L meas. ______ Field aquifer char. ______

Hyd. lab. data: ______

Qual. water data: type: ______

Freq. sampling: ______ Pumpage inventory: yes no; period: ______

Aperture cards: ______ yes

Log data: ______

WELL-DESCRIPTION CARD

8.00 SAME AS ON MASTER CARD — Depth well: 30 ft — Meas. rep. survey accuracy

1.1') Depth cased (first perf.): ______ ft — Casing type: iron; Diam. 6 in

6.0 Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other

Method Drilled: (A) air rot., (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other

Date Drilled: Unknown — Pump intake setting: 30 ft

Driller: ______

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cont.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other — Deep / Shallow

Power (type): (D) diesel, (E) elec, (G) nat gas, gasoline, hand, gas, wind; H.P. 1/2 — Trans. or meter no. ______

Descrip. MP: cap ... surface 0.3 ft above LSD, Alt. MP ______

Alt. LSD: ______ Accuracy (source): ______

Water level: 6.10 ft above/below MP, ft above/below LSD — Accuracy: ______

Date meas.: 12-26-73 — Yield: ______ gpm — Method determined: ______

Drawdown: ______ ft — Accuracy: ______ Pumping period: ______ hrs

QUALITY OF WATER DATA: Iron ______ Sulfate ______ Chloride .034% Hard. ______

Sp. Conduct: 1350 K x 10^6 — Temp. 54° — Date sampled: 12-26-73

Taste, color, etc.: pH 6.6 iron and Ill taste

Well no. 39/9 25 abd

HYDROGEOLOGIC CARD

Well No. ______

Latitude-longitude ______

SAME AS ON MASTER CARD — Physiographic Province: ______ Section: ______

Drainage Basin: ______ Subbasin: ______

Topo of well site: (D) depression, (C) stream channel, (S) dunes, (F) flat, (H) hilltop, (K) sink, (E) swamp, (O) offshore, (P) pediment, (B) hillside, (T) terrace, (U) undulating, (V) valley flat

MAJOR AQUIFER: ______ system ______ series ______ aquifer, formation, group

Lithology: ______ Origin: ______ Aquifer Thickness: ______ ft

Length of well open to: ______ ft — Depth to top of: ______ ft

MINOR AQUIFER: ______ system ______ series ______ aquifer, formation, group

Lithology: ______ Origin: ______ Aquifer Thickness: ______ ft

Length of well open to: ______ ft — Depth to top of: ______ ft

Intervals Screened: ______

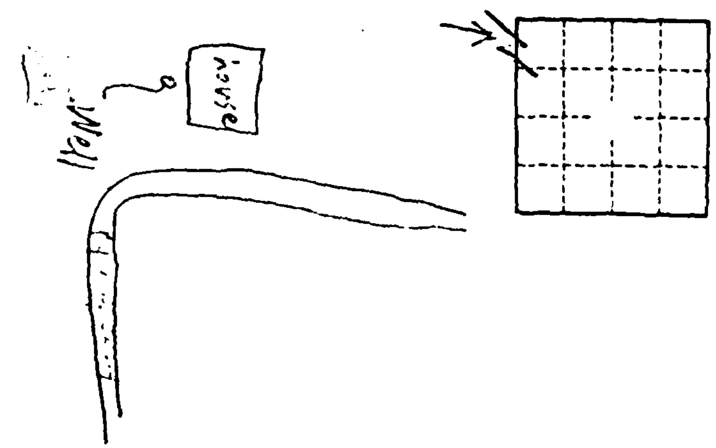
Depth to consolidated rock: ______ ft — Source of data: ______

Depth to basement: ______ ft — Source of data: ______

Surficial material: ______ Infiltration characteristics: ______

Coefficient Trans: ______ gpd/ft — Coefficient Storage: ______

Coefficient Perm: ______ gpd/ft²; Spec cap: ______ gpm/ft; Number of geologic cards: ______



Well No. 39-9 25 abd

(12)

GPO 830-883

Appendix M

SPECIFICATION PD-680

09-13-17

P-D-680
AMENDMENT—2
June 8, 1964

SUPERSEDING
Amendment—1
August 27, 1963

FEDERAL SPECIFICATION

DRY CLEANING SOLVENT

This amendment, which forms a part of Federal Specification P-D-680, dated March 27, 1963, was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

Page 2, table I: Delete "Color, Saybolt, not greater than" and substitute "Color, Saybolt, not darker than".

Page 2, table I, Under distillation range: Delete "50% distilled by vol., min." and substitute "Minimum 50 percent distilled, °F.".

MILITARY INTERESTS:

Army—MU MR GL

Navy—Sh

Air Force—MAAMA

☆ U. S. GOVERNMENT PRINTING OFFICE: 1964-341-519/A-1474

FSC 6850

M

09-13-17

FEDERAL SPECIFICATION

DRY CLEANING SOLVENT

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MILITARY INTERESTS:
Army—MU MR GL
Navy—Sh
Air Force—MAAMA

FSC 6850

☆ U.S. GOVERNMENT PRINTING OFFICE 1963— 708848/59

09-13-17

P-D-680
March 27, 1963

SUPERSEDING
Int. Fed. Spec. P-S-00661c(GSA-FSS)
June 13, 1963 and
Fed. Spec. P-S-661b
April 6, 1953

FEDERAL SPECIFICATION

DRY CLEANING SOLVENT

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers two types of petroleum distillates employed for dry cleaning of textile materials, and referred to industrially as "Stoddard Solvent" and as "140° F. Solvent".

1.2 Classification.

1.2.1 *Types.* Dry-cleaning solvent shall be of the following types, as specified:

Type I.—100°F. Solvent (Stoddard Solvent).

Type II.—140°F. Solvent.

2. APPLICABLE SPECIFICATIONS, STANDARDS, AND OTHER PUBLICATIONS

2.1 Specifications and Standards. The following specifications and standards, of the issues in effect on date of invitation for bids, form a part of this specification:

Federal Standards:

Fed. Std. No. 102—Preservation, Packaging, and Packing Levels.
Fed. Std. No. 123—Marking for Domestic Shipment (Civilian Agencies).
Fed. Test Method Std. No. 791—Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications, Standards, and Handbooks and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, and Auburn, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications, Standards, and Handbooks from established distribution points in their agencies.)

Military Standards:

MIL-STD-105—Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129—Marking for Shipment and Storage.
MIL-STD-290—Packaging, Packing and Marking of Petroleum and Related Products.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

FSC 6850

2.2 **Other publications.** The following publications form a part of this specification. Unless otherwise indicated, the issues in effect on date of invitation for bids shall apply:

American Society for Testing and Materials Publication:

Part 7—Petroleum Products and Lubricants.

(Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

Uniform Classification Committee Publication:

Uniform Freight Classification Rules.

(Application for copies should be addressed to Uniform Classification Committee, 202 Union Station, Chicago 6, Illinois.)

3. REQUIREMENTS

3.1 **Material.** The material shall be a petroleum distillate.

3.2 **Physical and chemical properties.** The physical and chemical properties of the solvents shall conform to the requirements specified in table I.

3.3 **Workmanship.** The dry cleaning solvent shall be clear, free from suspended matter and undissolved water as determined by visual inspection.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

TABLE I. *Physical and chemical properties*

	Type I	Type II	Test Para.
Appearance	Clear, free from suspended matter, and undissolved water		4.4.2
Color, Saybolt, not greater than	21	21	
Odor	Sweet	Sweet	4.4.3
Corrosion of copper strip 212° F. for 3 hours	Slight tarnish[1]		
Distillation range:			
Initial boiling pt., min.	300° F.	350° F.	
50% distilled by vol., min.	350° F.	375° F.	
End point, max.	410° F.	415° F.	
Distillation residue, max.	1.5%	1.5%	4.4.4
Acidity-reaction of residue to methyl orange	Neutral	Neutral	4.4.5
Doctor test	Negative	Negative	4.4.1
Flash Point, Tag Closed Cup, min.	100° F.	138° F.	4.4.1
Sulfuric acid absorption, max.	5%	5%	4.4.1

[1] Shall correspond to classification number 1 of ASTM designation D 130.

4.2 Sampling.

4.2.1 *Lot.* For purposes of sampling, a lot shall consist of solvents from one batch or tank offered for delivery at one time. If material cannot be identified by batch or tank, a lot shall consist of not more than 10,000 gallons offered for delivery at one time.

4.2.2 *Sampling for inspection of containers.* A random sample of filled containers shall be taken by the Government inspector in accordance with Military Standard MIL-

STD-105 at inspection level I and acceptable quality level = 2.5 percent defective to verify compliance with this specification in regard to fill, closure, marking, and other requirements not involving tests.

4.2.3 *Sampling for tests.* From each inspection lot (see 4.2.1), the inspector shall take two containers at random. From each of the two containers 1-quart specimens shall be taken and placed in separate, clean, dry, metal, or glass containers, and then sealed, marked, and forwarded to the testing laboratory designated by the procuring activity.

4.3 Inspection of containers. Each sample filled container shall be examined for defects of construction of the container and the closure, for evidence of leakage, and for unsatisfactory markings; each filled container shall be weighed to determine the amount of contents. Any container in the sample having one or more defects, or under required fill, shall be rejected and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.4 Test procedures

4.4.1 *Physical and chemical properties.* These determinations shall be made in accordance with the methods specified in table II.

4.4.2 *Appearance.* Examine the solvent for undissolved water, sediment and suspended matter by the use of transmitted light.

4.4.3 *Odor.* If the odor is questionable the following test shall be performed. Desized and laundered bleached cotton cloth of 3.6 to 4.0 ounces per square yard shall be used for this test. The cloth when lightly steamed shall have no odor except that of clean cotton cloth. The cloth shall be conditioned at 50 to 80 percent R.H. and 65°

TABLE II. *Test procedures*

	Applicable method in Fed. Test Method Std. No. 791	Test method paragraph	Requirement paragraph
Appearance	—	4.4.2	Table I
Color	101.6	—	Table I
Odor	—	4.4.3	Table I
Copper Corrosion	5325.2	—	Table I
Distillation			
Distillation range	1001.9		Table I
Distillation residue		4.4.4	Table I
Acidity	—	4.4.5	Table I
Doctor test	5203.2	—	Table I
Flash point	1101.5	—	Table I
Sulfuric Acid Absorption	(See Note)	—	

Note: Determine according to ASTM D484-52.

to 90°F. for 4 hours. A piece of the conditioned cloth approximately 12 inches square shall be placed in 100 milliliters of solvent so as to be completely submerged, and allowed to soak for 5 minutes. The cloth shall then be removed, drained, but not squeezed or extracted and hung at room temperature for 2 hours. The cloth shall then be dried in a stream of fresh air heated to 140° to 160° F. (60° to 71°C.) for 1 hour. The odor of the dried cloth when steamed over boiling water for 4 to 5 seconds, shall not differ from that of an untreated sample similarly steamed.

4.4.4 *Distillation residue.* Pour the distillation residue from the flask into a small cylinder graduated to 0.1 milliliter. Cool, measure and record the volume as residue.

4.4.5 *Acidity.* Make this test immediately after recording the volume of distillation residue. Transfer the cooled residue to a test tube, add three volumes of distilled water, and shake the tube thoroughly. Allow the mixture to separate and remove the aqueous layer to a clean test tube by means of a pipette. Add 1 drop of 0.1 percent aqueous solution of methyl orange. A pink or red color indicates the presence of mineral acid.

5. PREPARATION FOR DELIVERY

For civil agency procurement, the definitions and applications of the levels of packaging and packing shall be in accordance with Fed. Std. No. 102.

5.1 Packaging and packing.

5.1.1 *Levels A and B.* The solvent shall be packaged and packed in accordance with MIL-STD-290 as specified for the applicable level (see 6.2).

5.1.2 *Level C.* Commercial unit and bulk containers shall be packed so as to be acceptable by common or other carriers for safe transportation to point of destination specified in shipping instruction at the lowest transportation rate.

5.2 Marking.

5.2.1 *Civil agencies.* In addition to any special marking required by the contract or order, marking for shipment shall be in accordance with Fed. Std. No. 123.

5.2.2 *Military agencies.* In addition to any special marking required by the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

6. NOTES

6.1 **Intended use.** The product is intended for use as a dry-cleaning solvent.

6.1.1 Type I is intended for use as a comparatively safe dry-cleaning solvent.

6.1.2 Type II is intended for use in dry-cleaning plants where a solvent with a higher flash-point is desirable as an additional safety factor.

6.2 **Ordering data.** Procurement documents should specify the following:

(a) Title, number and date of this specification.

(b) Type of solvent required (see 1.2).

(c) Size of containers and level of protection required (see 5.1 and 5.2).

6.3 **Purchase unit.** The solvent shall be purchased by volume, the unit being a U.S. gallon of 231 cubic inches at 60°F. (15.6°C.). The volume may be determined by dividing the net weight, in pounds, by the weight per gallon.

6.4 **Transportation description.** Transportation descriptions and minimum weights applicable to this commodity are:

Rail:

Chemicals, not otherwise indexed by name.

Carload minimum weight 24,000 pounds, subject to Rule 34, Uniform Freight Classification.

Motor:

Chemicals, not otherwise indexed.

Truckload minimum weight 24,000 pounds, subject to Rule 115, National Motor Freight Classification.

6.5 **Certification.** Solvent delivered in cans, drums, or tank cars shall either be accompanied by an official gager's certificate showing the net contents of each container and also the temperature of the contents at the time of gaging or shall be subject to gaging by the Government inspector. In the absence of a statement of the temperature at the time of gaging on the official gager's certificate, or in case the barrels show evidence of loss by leakage or other shortages, the delivery shall be subject to

re-inspection and re-gaging by the Government inspector.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

MILITARY INTERESTS:

Army—MU MR GL

Navy—Sh

Air Force—MAAMA

☆ U.S. GOVERNMENT PRINTING OFFICE: 1963—[illegible]

Copies of this specification may be purchased for 5 cents each.

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

HAZARD ASSESSMENT RATING METHODOLOGY
FOR KINGSLEY FIELD, OREGON

Prepared for

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Directorate of Environmental Planning
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Appendix N
NEW HAZARDOUS ASSESSMENT RATING METHODOLOGY

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided in Figure 2 and the rating factor guidelines are provided in Table 1.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste managment practices category factor to the sum of the scores for the other three categories.

FIGURE 1

SITE RATING
METHODOLOGY FLOW CHART

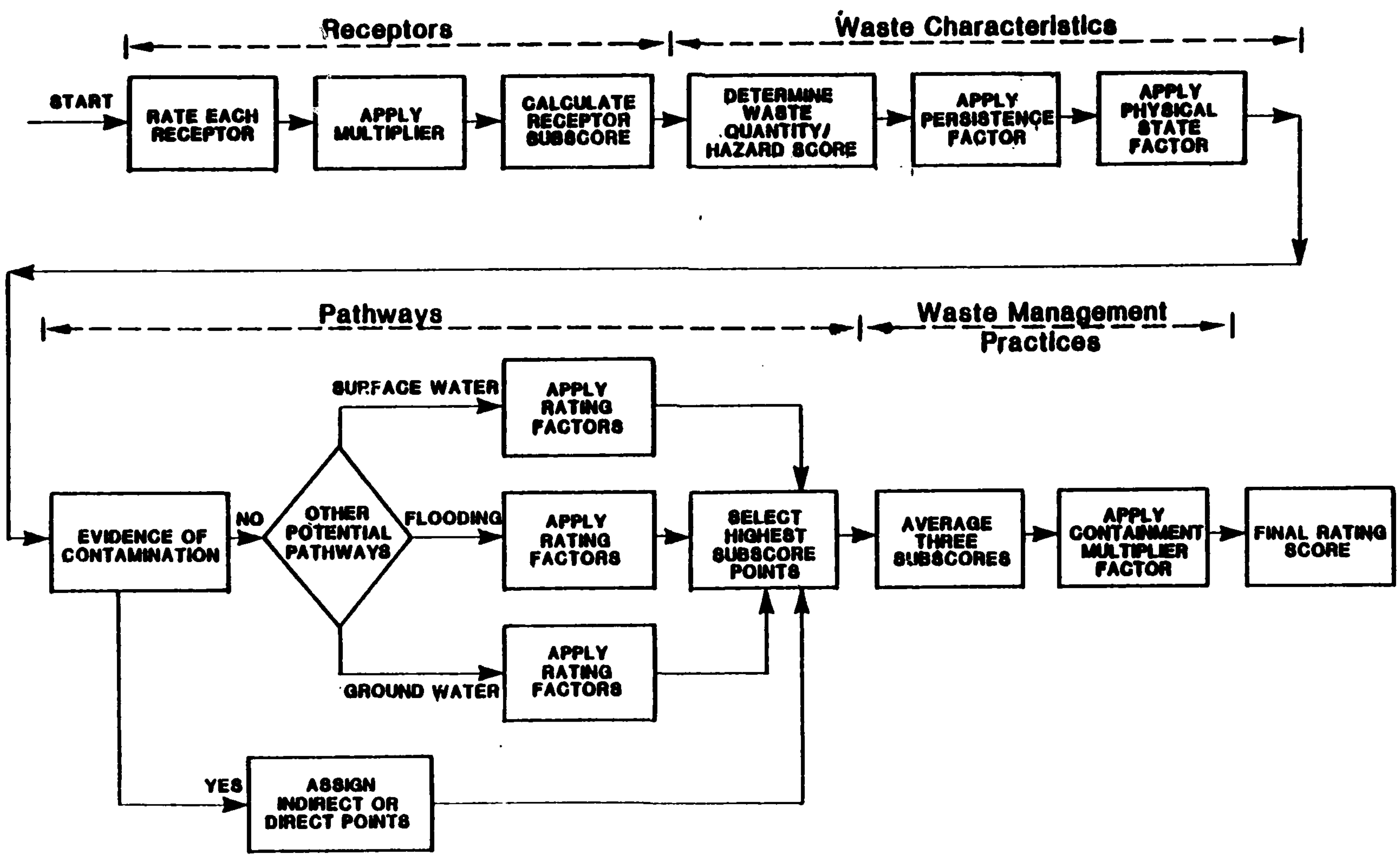

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and *quantities of hazardous wastes generated* at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
D. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION					
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, . . .	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- Clay cap or other impermeable cover
- Leachate collection system
- Liners in good condition
- Adequate monitoring wells

Spills:

- Quick spill cleanup action taken
- Contaminated soil removed
- Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- Liners in good condition
- Sound dikes and adequate freeboard
- Adequate monitoring wells

Fire Proection Training Areas:

- Concrete surface and berms
- Oil/water separator for pretreatment of runoff
- Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

Appendix O
NEW SITE RATING FORMS

Table 1
SUMMARY OF RESULTS OF SITE ASSESSMENTS

Site No.	Site Description	Subscores (% of Maximum Possible Score in Each Category)			Overall Score (Sum of Subscores/3)
		Receptors	Pathways	Waste Characteristics	
2	Base Landfill	52	82	20	51
3	Base Landfill	59	82	50	64
8	Existing Fire Department Training Area	52	54	48	51
11	Diesel Fuel Spill	52	40	24	39

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 2, Base Landfill

LOCATION: Kingsley Field, Oregon

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Kingsley Field, Oregon

COMMENTS/DESCRIPTION: *Industrial/domestic fill*

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	2	10	20	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	2	6	12	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	93	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

20 x 1.0 = 20

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
		Subtotals	94	114
Subscore (100 x factor score subtotal/maximum score subtotal)				82

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 82

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	20
Pathways	82
Total 154 divided by 3 =	51
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

1.0 x 51 = 51

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 3, Base Landfill

LOCATION: Kingsley Field, Oregon

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Kingsley Field, Oregon

COMMENTS/DESCRIPTION: Industrial/domestic fill

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	2	6	12	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	106	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	80
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	18	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	94
		Subtotals	94	114
Subscore (100 x factor score subtotal/maximum score subtotal)				82

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 82

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	59
Waste Characteristics	50
Pathways	82
Total 191 divided by 3 =	64 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

1.0 x 64 = 64

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 8, Existing Fire Department Training Area

LOCATION: Kingsley Field, Oregon

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Kingsley Field, Oregon

COMMENTS/DESCRIPTION: POL solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	2	10	20	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	2	6	12	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	93	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
		Subtotals	62	114
Subscore (100 x factor score subtotal/maximum score subtotal)				54

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore **54**

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	48
Pathways	54
Total 154 divided by 3 =	51 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

1.0 x 51 = **51**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 11, Diesel Spill

LOCATION: Kingsley Field, Oregon

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Kingsley Field, Oregon

COMMENTS/DESCRIPTION: --

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	2	10	20	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	2	6	12	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	93	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

30 x .8 = 24

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

24 x 1.0 = 24

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-wate- migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 40

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	24
Pathways	40
Total 116 divided by 3 =	39
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

1.0 x 39 = 39

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